S. HRG. 107–355, PT. 5

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 2002

HEARINGS

BEFORE THE

COMMITTEE ON ARMED SERVICES
UNITED STATES SENATE

ONE HUNDRED SEVENTH CONGRESS

FIRST SESSION

ON

S. 1416

AUTHORIZING APPROPRIATIONS FOR FISCAL YEAR 2002 FOR MILITARY ACTIVITIES OF THE DEPARTMENT OF DEFENSE, FOR MILITARY CONSTRUCTION, AND FOR DEFENSE ACTIVITIES OF THE DEPARTMENT OF ENERGY, TO PRESCRIBE PERSONNEL STRENGTHS FOR SUCH FISCAL YEAR FOR THE ARMED FORCES, AND FOR OTHER PURPOSES

PART 5

EMERGING THREATS AND CAPABILITIES

MAY 15 AND JULY 12, 2001

Printed for the use of the Committee on Armed Services

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CONTENTS

CHRONOLOGICAL LIST OF WITNESSES

Department of Energy's Nuclear Nonproliferation Programs

MAY 15, 2001

Cooperative Threat Reduction, Chemical Weapons Demilitarization, Defense Threat Reduction Agency, Nonproliferation Research and Engineering, and Related Programs

JULY 12, 2001

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 2002

TUESDAY, MAY 15, 2001

U.S. SENATE,
SUBCOMMITTEE ON EMERGING THREATS
AND CAPABILITIES,
COMMITTEE ON ARMED SERVICES,
Washington, DC.

DEPARTMENT OF ENERGY'S NUCLEAR NONPROLIFERATION PROGRAMS

The subcommittee met, pursuant to notice, at 2:34 p.m., in room SR–222, Russell Senate Office Building, Senator Pat Roberts (chairman of the subcommittee) presiding.

Committee members present: Senators Roberts, Allard, and Landrieu.

Committee staff members present: L. David Cherington, counsel.

Professional staff members present: Edward H. Edens IV, Carolyn M. Hanna, and Mary Alice A. Hayward.

Minority staff members present: David S. Lyles, staff director for the minority; Madelyn R. Creedon, minority counsel; and Creighton Greene, professional staff member.

Staff assistants present: Jennifer L. Naccari and Suzanne K.L. Ross.

Committee members' assistants present: George M. Bernier III, assistant to Senator Santorum; Robert Alan McCurry, assistant to Senator Roberts; Douglas Flanders, assistant to Senator Allard; Erik Raven, assistant to Senator Byrd; Peter A. Contostavlos, assistant to Senator Bill Nelson; and Brady King, assistant to Senator Dayton.

OPENING STATEMENT OF SENATOR PAT ROBERTS, CHAIRMAN

Senator ROBERTS. The subcommittee will come to order.

General, I apologize to you and the witnesses from the General Accounting Office (GAO). We had a vote on the Senate floor, and that takes precedence. I have a statement that I would like to make, then we will recognize you, General, because I know your time is valuable, as is the GAO's.

This afternoon the Subcommittee on Emerging Threats and Capabilities meets to receive testimony on the fiscal year 2002 budget request for the Office of Defense Nuclear Nonproliferation in the National Nuclear Security Administration. Providing testimony for the National Nuclear Security Administration is Gen. John A. Gordon, who is the administrator.

I would like to welcome you, General. This is the first time you have testified before the subcommittee. I look forward to receiving your remarks and thank you for your testimony last week, in regards to homeland security.

In addition to the General, we have the GAO here today to provide testimony on two GAO reports that discuss two programs with the Office of Defense Nuclear Nonproliferation.

One of these GAO reports, the Nuclear Cities Initiative, will be released to the public at the conclusion of this hearing.

Providing testimony for the GAO is Ms. Gary L. Jones, the Director of Natural Resources and Environment. This is also your first time before this subcommittee. We thank you and I welcome you and look forward to your statement.

Following this open session we will move to a closed session in Hart 219 to hear testimony from representatives of the Intelligence Community. This subcommittee has had oversight responsibilities for the Office of Defense Nuclear Nonproliferation of the National Nuclear Security Administration. Try saying that five times real fast on CSPAN, and you will get in a lot of trouble.

The programs within this office work to prevent, detect, and reverse the proliferation of weapons of mass destruction, and to assist with international nuclear acts for safety and excess fissile material elimination.

Over 50 percent of the office's budget supports programs in Russia. The remaining percent of the budget focuses on improving U.S. capabilities in proliferation monitoring and detection through research and development.

As many know, last year this subcommittee found programmatic management problems, problems and challenges with several programs in this Cooperative Threat Reduction endeavor.

To that end, the subcommittee established greater reporting controls on these programs to improve management and accountability in the implementation of these critical national security programs. It is imperative that the United States have every measure available to ensure Russia's long-term commitment to U.S. threat reduction and nonproliferation cooperative work.

I cannot stress enough how important it is that these programs are carried out effectively, efficiently, and have the committed support of the Russians.

Over the next few weeks, I will review in great detail the administration's budget request for these programs. It will be a priority of this subcommittee to ensure that the funds requested will be utilized effectively and efficiently, and that program goals can be realized with the resources that we have.

We must ensure that our current and future national security efforts are not weakened by management failures and poor implementation on what I consider to be a vital national security effort.

I look forward to the comments of both witnesses this afternoon on the progress they have made in addressing this subcommittee's concerns with these programs, and how they intend to proceed during the coming year. I believe they are doing very critical work, very important, critical work in protecting our nation. I commend them for their perseverance and dedication.

I thank you for the time and attention that you have placed in preparing your remarks for this afternoon. I will turn to my esteemed Ranking Member, when she arrives to the subcommittee, for any comment that she might have. I would now like to welcome for his statement General Gordon.

[The prepared statement of Senator Roberts follows:]

PREPARED STATEMENT BY SENATOR PAT ROBERTS

This afternoon the Subcommittee on Emerging Threats and Capabilities meets to receive testimony on the fiscal year 2002 budget request for the Office of Defense Nuclear Nonproliferation in National Nuclear Security Administration. Providing testimony for the National Nuclear Security Administration is Gen. John A. Gordon, Administrator. I would like to welcome you, General Gordon. This is the first time you have testified before the subcommittee and I look forward to receiving your remarks.

In addition to General Gordon, we have the GAO here today who will provide testimony on two GAO reports that discuss two programs within the Office of Defense Nuclear Nonproliferation. One of these GAO reports, this one on the Nuclear Cities Initiative, will be released to the public at the conclusion of this hearing. Providing testimony for the GAO is Ms. Gary L. Jones, Director, Natural Resources and Environment. This is also your first time before this subcommittee. I welcome you, Ms. Jones, and look forward to your statement.

Following this open session, we will move to closed session in Hart 219 to hear testimony from representatives of the Intelligence Community.

This subcommittee has oversight responsibilities for the Office of Defense Nuclear Nonproliferation of the National Nuclear Security Administration. The programs within this office work to prevent, detect, and reverse the proliferation of weapons of mass destruction and to assist with international nuclear reactor safety and excess fissile material elimination. Over 50 percent of the office's budget supports programs in Russia. The remaining percent of the budget focuses on improving U.S. capabilities in proliferation monitoring and detection through research and development.

Last year this subcommittee found programmatic management problems with several programs in this cooperative threat reduction endeavor. To that end, this subcommittee established greater reporting controls on these programs to improve management and accountability in the implementation of these critical national security programs. It is imperative that the United States have every measure available to ensure Russian long term commitment to U.S. threat reduction and nonproliferation cooperative work. I cannot stress enough how important it is that these programs are carried out effectively and efficiently and have committed Russian support.

Over the next few weeks, I will review in great detail the administration's budget request for these programs. It will be a priority of this subcommittee to ensure that the funds requested will be utilized effectively and efficiently and that program goals can be realized with the resources we have. We must ensure that our current and future national security efforts are not weakened by management failures and poor implementation in what I consider to be a vital, national security effort.

I look forward to your comments this afternoon on the progress you have made in addressing this subcommittee's concerns with these programs and how you intend to proceed during the coming year. I believe you are doing critical work in protecting our Nation and I commend you for your perseverance and dedication. I thank you for the time and attention you have placed in preparing your remarks for this hearing.

Please proceed, General Gordon.

General GORDON. Thank you very much, Mr. Chairman, for the opportunity to meet with the subcommittee today and discuss the fiscal year 2002 budget request for the National Nuclear Security Administration. I do have a little bit longer formal statement that I would offer for the record, sir.

Senator ROBERTS. Without objection, please feel free to summarize as you see fit, sir.

STATEMENT OF GEN. JOHN A. GORDON, USAF (RET.), UNDER SECRETARY FOR NUCLEAR SECURITY AND ADMINISTRATOR, NATIONAL NUCLEAR SECURITY ADMINISTRATION, U.S. DEPARTMENT OF ENERGY

General GORDON. I also want to thank the members of the subcommittee for their continuous support for the mission of NNSA and for the people who really make it happen here in Washington and in the field, those traveling overseas, the Federal workforce, the contract workforce, a lot of folks who are working pretty hard on these initiatives, Mr. Chairman.

If I could speak for a few moments broadly about NNSA before we turn to the details of the budget itself, I want to report to you that we are making steady, albeit somewhat slow progress towards the goals I think we all share of having efficient and effective organization to lead and manage the national security enterprise that's been entrusted to us.

I'm not particularly satisfied with where we are, nor what we have been able to accomplish to establish NNSA as a full-up organization with a unique identity and the clear lines of authority that we need.

We're moving forward, and we've made remarkable progress when measured against the barriers and bureaucracy that we confront. Even though it has been difficult to move dramatically on organizational issues, we've gotten well beyond some of the issues that confronted us in the beginning, such as dual hatting.

We have set up a new framework for the organization and management of NNSA, and we have brought on board critical staff for vital issues such as counter-intelligence, security and contracting, and made real progress in each of these areas.

We have on board two senior advisors of immense capacity, Director of Congressional Affairs and an Environmental Safety and Health Advisor with professional experience from naval reactors, a senior military assistant, and a strong chief of staff who knows the system in considerable detail.

I've established an Office of Policy Planning that will really help us work better in the inner agency. An acting principal deputy for NNSA will be starting this week helping move the organization forward while we seek congressional authority for a confirmed Presidential approved position.

We plan to announce the choice of an NNSA general counsel within the next couple of days.

Perhaps most importantly I am hopeful that the President will very soon be able to announce his intention to nominate NNSA's two deputy administrators.

That said, Mr. Chairman, let me focus my comments on efforts on nonproliferation.

In this decade after the Cold War, the United States continues to wrestle with the dangers arising from enormous stockpiles of nuclear weapons and the materials produced by the former Soviet Union from the extensive nuclear establishment inherited by Russia.

We must also contend with concerted efforts by rogue states and others to acquire weapons of mass destruction, and with the threat that terrorists might gain access to these weapons or to quantities of material.

Mr. Chairman, I would like to reiterate my thanks to you and your colleagues for last week's hearings which discussed the importance of focusing national attention on combating terrorism, particularly with the focus on WMD.

The NNSA is pursuing programs to address the threats of WMD proliferation, both in the former Soviet Union and worldwide. The fiscal year 2002 budget request is $773.7 million for nonproliferation programs. Our request covers ongoing efforts to provide security for nuclear materials to implement the purchase and conversion of weapon-grade usable highly enriched uranium, and, to dispose of excess weapons-grade plutonium.

It seeks funding for programs that redirect the activities of weapons scientists, including the development of commercial partnerships with U.S. industry, and encourages the down-sizing of the Russian nuclear weapons complex.

The same request funds the development of new technologies to detect chemical and biological weapons, to monitor nuclear testing worldwide, to implement U.S. export controls on nuclear technology, other international nuclear safeguards, and to strengthen the safety of Soviet-designed nuclear reactors.

We literally provide the technical base for much of what our government does in proliferation protection and provide the expertise base to work effectively inside Russia and elsewhere.

Before I get to questions, Mr. Chairman, the administration's request for proliferation programs is $101 million less than last year's appropriation. At that level it should be apparent and obvious that we will have to curtail efforts in several areas and potentially lose momentum in others; however, and I will talk more about this later, the administration is conducting a review of each program, and we await the conclusion of that review to see if the budget request should be modified.

The problems we're trying to address are hard. It's not easy to persuade Russia that it needs our help in facilities at the heart of its nuclear weapons complex, nor to find private sector partners willing to invest in an uncertain and unproven business environment.

Our Russian counterparts sometimes doubt our motives and our commitments, and even when we have their support, we still have to cope with the suspicions of the Russian security services, as well as their legitimate interests, in protecting what remain highly sensitive activities and facilities.

We remain concerned about the extent to which Russian authorities (including MinAtom leadership) share a common view of nonproliferation objectives.

Nuclear-related exports to Iran continue to be highly troubling. We need to ensure that our programs do not inadvertently support continuing military activities and that our funds are spent on their intended purposes.

Even taking account of these problems, however, nonproliferation cooperation with Russia remains highly beneficial to the United States, addressing real threats to our nation in both immediate and long terms. It reduces the danger that nuclear materials will find their way to our adversaries, builds barriers against transfer of nuclear weapon expertise, and strengthens our ability to combat proliferation globally.

In a number of areas we have built a basis for mutual confidence with Russian scientists, military officers, and plant managers, and that has permitted us to work together towards common security objectives in ways that probably were not imaginable only a few years ago.

Ultimately, we recognize the resources required to transform the safeguarding of Russia's nuclear weapon establishment are probably beyond the scope of any conceivable U.S. assistance program. Fundamentally, this transformation has to be a Russian responsibility. But we can show the way, we can be a catalyst, and we can demonstrate what's possible to the Russians and to business communities.

Many of the members of this subcommittee are very familiar with some of the examples of what has been done, and we have just touched on a couple of those. Rapid security upgrades have been completed on more than 3,000 nuclear weapons warheads and some 220 tons of fissile material. The goal for fiscal year 2002 is to complete the upgrades on another 13 sites, bringing the total to 50.

We have developed training, procurement, internal accounting, and regulatory measures to help ensure Russia can sustain operation of the improved security measures we've provided.

We have initiated the design of a mixed oxide fuel fabrication facility and a pit disassembly and conversion facility, to enable us to meet the commitments of our bilateral plutonium disposition agreement with Russia and support Russian development of a comparable program.

We've installed monitoring equipment at the first of three Russian facilities for transparency of the down-blending of the highly-enriched uranium that the U.S. is purchasing.

As I mentioned earlier, the administration is reviewing U.S. nonproliferation operations in connection with Russia, taking a comprehensive look across agency lines. It's quite likely that the administration will request adjustment of the budget once these reviews are complete. NNSA is a full participant in this review process.

I expect and certainly hope the administration will develop an over arching strategy that really sets the priorities and the realistic goals, and that it will take a fresh look at how nonproliferation activities fit into our overall policy toward Russia. The review is critically examining the effectiveness of existing programs and will identify needed changes in focus, organization, or management approach.

We're also considering new ideas and new approaches. But even so, we're mindful of how difficult it is to operate in this environment, and the ongoing reviews and policy development activities must specifically deal with Russian attitudes, their relationships with proliferation issues, access, and issues of sustainability. I expect this review to be completed shortly. After which we can brief the subcommittee on the results.

Mr. Chairman, with NNSA I'm also committed to my own review of the management and implementation of our programs and how the individual pieces fit together. As I noted earlier, I hope we will soon have on board a Senate-confirmed Deputy Administrator who can work with me and the program offices to ensure that our nonproliferation programs have clear, stable goals and realistic plans that are integrated within NNSA and integrated within the interagency community.

We'll be careful not to promise more than we can deliver, and we'll do our level best to deliver what we promise.

We'll be straight with Congress and straight with ourselves about the real problems of working with Russia, and straight with the Russians about what we have to have in order to do business.

In running these programs, I'll be mindful of the critically important contribution that they can and do make to national security, and equally mindful of the need to ensure responsible and accountable management of taxpayer dollars.

Mr. Chairman, I know that in a couple of moments the GAO will be testifying on their reports on the Nuclear Cities Initiative (NCI) and the Material Protection Control and Accounting (MPC&A). Let me offer a few thoughts. First with respect to NCI.

The closed cities of the Russian nuclear complex clearly present some of the most difficult environments for success in nonproliferation. These cities are out of the Russian mainstream and have little history of commercial business or economic integration. Our key goal here is to encourage the downsizing of the Russian nuclear weapons design and production facilities without creating additional proliferation risks.

NCI is a relatively young program that encountered several start-up problems, including lack of Russian support in some channels, high overhead and start-up costs, and program management inefficiencies.

Nevertheless, it has had some initial successes. Last year for the first time the Avangard nuclear weapons facility reduced its footprint, creating some 500,000 square feet of commercial production space where once nuclear weapons components were made.

NCI has built a partnership with the Fresenius Medical Corporation, the world's largest manufacturer of dialysis equipment, who is eager to utilize this space and take advantage of the relatively lower production costs in Russia.

Another modest success is the establishment of two open computing centers in Sarov and Snezhinsk. Mr. Chairman, while it's my understanding that the about-to-be-released GAO report on NCI does not take issue with the basic goals of the NCI program, it clearly identifies several areas in which we need to make important management improvements.

For example, we can do much better reviewing candidate proposals for new projects as we do now in the Initiatives for Proliferation Prevention (IPP) program, largely because we followed and took on board earlier GAO recommendations.

In fact, this recommendation for the NCI program has already been implemented. This set of recommendations by the GAO should help ensure the program is well-managed and transparent to me and to the subcommittee.

As I mentioned, NNSA will be doing a comprehensive review of how we manage these programs to ensure we're getting the best possible return for the taxpayer, and that we have the right objectives and right programmatic measures. The GAO recommendations, including an evaluation of possibly combining the NCI and IPP programs, will be important inputs.

One last point with regard to NCI. We need to continue our dialogue with the subcommittee and Congress to see if we can release the $10 million currently conditioned on agreement with Russia regarding facility closure. We have a written commitment to that effect from First Minister of MinAtom, Mr. Ryabev.

I'll close, Mr. Chairman, with a comment on the Material Protection Control and Accounting program. The GAO report here is fair, balanced, and reflects over a year of work by the GAO team. I understand the report states that the MPC&A programs have achieved real threat reductions on some 32 percent—some 190 metric tons of the estimated 603 metric tons of Russian material that could be used to make a nuclear device. The report acknowledges that the work being performed by the program is on an additional 130 tons.

These figures do not reflect the upgraded security protection on several thousand nuclear warheads controlled by the Russian Navy. Here, too, however, I also agree with the GAO that significant work remains to be done, and in this regard, we will implement the GAO's two major recommendations.

First, the NNSA will develop a system to better monitor the security systems installed and ensure that they continue to function—the sustainability question.

Second, our strategic plan will include estimates for sustainability activities.

Mr. Chairman, I believe I'll stop at this point so we can turn to your questions or however you would like to proceed. I do appreciate very much the opportunity to join with you today to discuss this important program which I believe does provide such a valuable and important contribution to U.S. national security.

[The prepared statement of General Gordon follows:]

PREPARED STATEMENT BY GEN. JOHN A. GORDON

Mr. Chairman and members of the Subcommittee, thank you for the opportunity to testify on the National Nuclear Security Administration's (NNSA) nonproliferation fiscal year 2002 budget request.

The fiscal year 2002 budget request for the Office of Defense Nuclear Nonproliferation is $773.7 million. The request covers the funding needed to support a broad range of nonproliferation goals. Specific line items include:

- Nonproliferation and Verification Research and Development ($206,102,000)
- International Nuclear Safety ($13,800,000)
- Highly Enriched Uranium (HEU) Transparency Implementation ($13,950,000)
- Arms Control and Nonproliferation ($101,500,000)
- International Materials Protection, Control and Accounting ($138,800,000)
- Fissile Materials Disposition ($248,089,000)
- Program Direction ($51,459,000)

Addressing international threats to U.S. national security interests from the potential proliferation of weapons of mass destruction is one of the primary mission goals of the NNSA. These international threats derive largely from the former Soviet Union's production of enormous quantities of nuclear materials and weapons, and from potential actions by rogue nations or terrorist organizations. The NNSA is pursuing a balanced and comprehensive approach to nonproliferation that seeks to reduce or eliminate these threats to U.S. national security interests.

NNSA has been hard at work to secure and dispose of nuclear warhead materials, at home and abroad. We are establishing methods to help prevent the unthinkable from happening, the use of weapons of mass destruction in an attack on this country or our citizens. NNSA's world-class expertise at its national laboratories is vital to the success of this important effort.

I understand the subcommittee has a particular interest in the work NNSA is doing in Russia. Therefore, I would like to address our efforts in that regard up front, and then talk more broadly about NNSA overall nonproliferation work.

The bipartisan Baker-Cutler Report and numerous other studies in-and-outside of Government attest not only to the importance of the proliferation threats in Russia our programs are designed to address, but to the need for an overarching strategy. We are working to articulate that strategy as well as to develop and strengthen our long-range thinking in this area.

To that end, the administration has chartered several major reviews in order to examine the appropriate national security strategy for this country. The Department and the NNSA are active participants in these ongoing reviews. One of these reviews is currently evaluating all U.S. nonproliferation programs with Russia. At the end of this review, I am confident we will have a comprehensive strategy for our threat reduction activities with Russia.

We can lay out the United States' goals we are helping with Russia into five broad objectives:

- Reduce the threat to the United States and its allies from Russian nuclear delivery systems
- Reduce potential for diversion of Russian nuclear warheads to rogue states or terrorist groups
- Reduce potential for diversion of Russian weapons-useable nuclear materials
- Make Russian force reconstitution more difficult, time consuming, and detectable
- Reduce potential for diversion of nuclear-weapon/dual-use expertise and technologies.

Given this set of objectives for our work in Russia, let me describe how our activities are supporting this framework. The first objective to reduce the threat to the U.S. and its allies from Russian nuclear delivery systems has been the principal goal of the DOD's Cooperative Threat Reduction (CTR) program. I will not deal with their myriad successes other than to note that they continue to make substantial progress in their programs.

Our next key objective is to reduce the potential of diversion of nuclear weapons. Both DOD and NNSA have programs that are working with the Russian military to improve the security of nuclear weapons storage sites in Russia. The NNSA program is with the Russian Navy and grew out of our cooperation with the Russian Navy on securing HEU materials used as reactor fuels on their ships. We feel that we are making good progress on this program. We have excellent cooperation with the Russian Navy on this program.

Our third objective is to reduce the potential for diversion of Russian Federation weapons-useable nuclear materials. This is the flagship of NNSA's cooperation with Russia. The Materials Protection, Control, and Accounting (MPC&A) program has been working with MinAtom on securing weapons-useable nuclear materials throughout Russia. We work with the civilian sites where such materials are present and we work at many of the military sites where the Russian weapons grade nuclear materials are stored.

The NNSA's MPC&A program is working rapidly to complete its mission, and estimates in its strategic plan that comprehensive security upgrades will be complete at all of the warhead storage locations that the Russian Navy has requested, as early as 2007, and for 603 metric tons of weapons-usable nuclear material by 2011. Since 1993, the program has completed rapid upgrades for nearly 4,000 warheads and 220 metric tons of fissile material. One programmatic goal for fiscal year 2002 is to complete security upgrades at thirteen nuclear sites, bringing the total number of completed sites to fifty.

A part of this goal is to promote sustainable security improvements. "Sustainability" is critical to the long-term mission of the program, because we must ensure that installed MPC&A systems are maintained and operated over the long term. Sustainability also entails fostering the ability of our Russian counterparts to operate and maintain the MPC&A systems unilaterally. To help ensure sustainability, we are establishing training centers, identifying credible Russian suppliers of MPC&A equipment, helping draft national regulations and security force procedures, and establishing an information accounting system to track amounts and locations for all of Russia's nuclear material.

Furthermore, we have developed and implemented a program to consolidate material into fewer buildings and fewer sites, and to convert excess highly attractive material to a form that is less attractive to potential proliferant nations. This program reduces costs to the U.S. by limiting the number of buildings requiring security upgrades.

Through the Fissile Materials Disposition program, NNSA is responsible for disposal of surplus inventories of U.S. weapon-grade plutonium and highly enriched uranium. We are also responsible for efforts to obtain reciprocal disposition of surplus Russian weapon-grade plutonium.

The fiscal year 2002 budget request will fund the completion of the mixed oxide (MOX) Fuel Fabrication Facility design and proceed with related MOX fuel qualification activities. We will continue the design of the Pit Disassembly and Conversion Facility at a reduced rate, and we will suspend the design of the Plutonium Immobilization Plant. These changes are necessary to reduce the anticipated future-year peak funding requirements associated with plans for simultaneously building three plutonium disposition facilities at the Savannah River Site. The NNSA continues to pursue the irradiation of MOX fuel in existing reactors and, at a much reduced pace, immobilization for the disposition of surplus U.S. weapon-grade plutonium. This will enable us to meet the commitments called for in the recently signed U.S.-Russia Plutonium Management and Disposition Agreement and to support the continued consolidation, cleanup, and shut down of DOE sites where surplus plutonium is stored.

Other activities planned for fiscal year 2002 involve providing support for the development of facilities in Russia for disposition of surplus plutonium, and continuing surplus U.S. HEU disposition, including capital improvements at the Savannah River Site to support the off-specification blend-down project with the TVA. This project will eliminate tons of surplus weapons material by converting it to reactor fuel for use in TVA's reactors, which provide electric power throughout the Southeast. Equally important, this work will save the taxpayers $600 million by avoiding the cost to dispose of this surplus material as waste.

We have a number of other programs that help achieve the objective of reducing the potential for diversion of nuclear materials. Through the Second Line of Defense program we have been working with the Customs Service in Russia to upgrade the Russian capabilities to detect and interdict nuclear materials at border checkpoints and at airports. While we have made some progress in this activity, this is a huge job. The Russian border is thousands of miles long, and borders on a number of countries where we have concerns about proliferation. We may need to put more effort into this program in the future or to develop and explore practical alternatives.

The current administration review of Russian programs will help guide us on whether or how we should direct our efforts on this issue, and how we should coordinate with other agencies that have complementary activities.

The fourth objective is to make reconstitution of the large forces and enormous nuclear weapons stockpile that existed during the Cold War more difficult. NNSA shares responsibility with DOD for programs that address this issue. For NNSA one of our problems is the size of the Russian nuclear weapons complex. The production complex of the U.S. is significantly reduced from what it was during the Cold War, while the Russian nuclear weapons complex is basically unchanged from the Cold War.

Some of these Russian facilities may be old, but the sense is, they can still do the job of producing weapons for the Russian stockpile. As we go into an era of reduced nuclear forces, this excess capability for production could present a problem for the U.S. We would like the Russian complex to be reduced to a size consistent with the much-reduced stockpiles that are needed in the post-Cold War era. Concerned about the human costs of downsizing, the Russians have asked us to help them reduce the size of their weapons complex. NNSA is pursuing the Nuclear Cities Initiative whose main goal is to reduce the size of the Russian nuclear weapons complex, both its facilities and infrastructure, as well as manpower.

While the underlying national security objective is valid, I am aware that there are some serious concerns about this program and I will elaborate on the Nuclear Cities Initiative a little later in my testimony. Based on the administration review of this and other nonproliferation programs in Russia, we may need to reconfigure the program to be more effective.

A part of this objective to make reconstitution to Cold War levels more difficult we are monitoring the HEU purchase agreement that is down-blending 500 metric tons of highly enriched uranium to low enrichment material that will be used in reactor fuel. The 1993 U.S.-Russia HEU Purchase Agreement remains one of our key threat reduction achievements of the last decade. As of May 2001, we have overseen the conversion of more than 117 metric tons of HEU; this is enough material for over 4,700 nuclear devices.

Our fifth objective is to reduce the potential for diversion of nuclear weapons or dual-use expertise and technologies. This objective captures two separate but related needs. One is that we need to work with the Russian Government to gain their cooperation on limiting the export of nuclear technology and equipment that may help countries that are trying to develop nuclear weapons. These exports are not, in our view, in the interest of either the United States or the Russian Federation, and mitigating the economic incentives that seem to propel them in this direction would help to achieve our goals.

The related issue is often referred to as the "brain drain". There are thousands of scientists that worked on the nuclear, chemical, and biological weapons programs of the Soviet Union who were unemployed, underemployed, or unpaid following the breakup of the USSR. NNSA and State Department have had programs in place for a number of years to provide alternate employment to as many of these scientists as possible and to try to integrate them into the international science community.

The State Department program is the International Science and Technology Centers (ISTC). It was created in 1992 and became operational in 1994. It is a multilateral organization and has excellent international support and strong support from the Russian Government. The NNSA programs are working in close cooperation with the ISTC. While the ISTC focused on providing jobs in basic science and exploring the possible application of technology to commercial applications, the Initiatives for Proliferation Prevention (IPP) program of NNSA has focused on the commercialization of Russian technology in partnership with U.S. industry.

The IPP program is designed to prevent the spread of weapons of mass destruction technologies and expertise by engaging former Soviet weapons scientists. It funds non-military joint R&D projects between former Soviet weapons institutes and U.S. laboratories. The goal is identifying and creating non-military, commercial applications of weapons-related technologies. We have instituted a rigorous project review process within the U.S. government to ensure that no projects have dual-use potential. These efforts allow us valuable access to Russian scientific and technical research and development as well as transparency into the Russian weapons complex. Unlike NCI, the IPP program works in the nuclear, chemical, and biological arenas and in Russia, Ukraine, and Kazakhstan. As we are focusing the IPP program on commercialization, all projects must have an industry partner who provides significant funding for the project—roughly a 3:2 ratio, private sector to government funding.

Those of you who have followed the progress of both the ISTC and the IPP programs might remember that both of these took several years to become mature and develop management processes and project portfolios that clearly met the intent of the programs.

But today the commercialization efforts of the IPP program are taking off. Eight IPP projects are now commercially successful, providing 300 long-term private-sector jobs in Russia and more that $17 million in annual sales revenues. There are another 20 IPP projects poised for commercialization over the next year. We are pleased with the progress that the IPP program has made in the past couple of years.

That brings me back to NCI. While the goals of the NCI program are to reduce the size and capability of the Russian nuclear weapons complex, it must address the unemployment that accompanies downsizing to accomplish that goal. NCI works with MinAtom to bring commercial development to the closed cities where the manpower requirements for nuclear weapons work are reduced or where entire plants stop weapons work.

This is a difficult task. Even in the U.S. when we downsize our weapons workforce or shut facilities, finding new jobs for those who are displaced is the most difficult part. But the U.S. economy is robust, and in most cases, our economy is able to absorb the extra workers within a reasonable amount of time.

In the closed cities in Russia, however, finding jobs for displaced workers is extremely difficult. There is little if any business culture, buildings are unsuitable for most western business, there are access rules, legal obstacles, and perhaps the largest difficulty is the Russian economy is smaller that it was a decade ago. But in spite of all these problems we have businesses that are interested in participating with us in working in the "closed cities". We try to provide them the necessary support to reduce their risks in putting jobs in these "closed cities," and helping them become successful. We are coordinating with the ISTC and the IPP program in this effort to develop jobs in the closed cities. However, the charters of the ISTC and the IPP program make it difficult for them to sponsor some of the types of activities that will make it more attractive for businesses to come to the closed cities; such as refurbishing buildings, and implementing manufacturing activities. With proper coordination, the combination of programs will make the prospect for successfully bringing commercial jobs to these cities much higher.

You might ask, "if the Russians are going to downsize their nuclear complex anyway, why should the U.S. spend its taxpayer dollars to help them?" The answer is, we can make the downsizing happen faster, and our involvement also gives us a window into the Russian complex. This may also allow us to have greater confidence in any future unilateral arms reductions if we know more about what their complex looks like.

Let me review the progress that the NCI program has made thus far. The program has been operating for roughly 2½ years and has been funded for only 26 months. Currently, NCI is working in three nuclear cities. The primary focus is on Sarov (formerly known as Arzamas-16) which includes both a nuclear weapons design laboratory and a nuclear weapons assembly/disassembly plant known as the Avangard Electromechanical plant. Sarov, and Avangard specifically, is MinAtom's highest conversion priority. Therefore, it is the one city we anticipate focusing on in fiscal year 2002.

Last year, this program achieved an historic accomplishment when the Russians moved a concrete fence at the Avangard weapons facility, creating an open "Technopark" for commercial businesses. This is the first time that a Russian weapons facility has reduced its footprint as part of the nuclear weapons complex downsizing they have committed to undertake. The Russian Government has indicated that it intends to shut down two of its weapons assembly and disassembly facilities. First Deputy Minister of MinAtom Lev Ryabev stated in an international forum in January 1999 that the Russian Government planned to close down two of its four weapons assembly and disassembly facilities, beginning in 2000. This intention was recently reinforced by a letter from Minister Ryabev to the NNSA in March 2001.

Finally, I would like to address GAO's report that was just released on the NCI program. Let me first say that I was pleased to read that the GAO determined that: "DOE's effort to help Russia create sustainable commercial jobs for its weapons scientists and help downsize its nuclear weapons complex is clearly in our national security interests." The report also highlights a number of issues and areas in the program that must be addressed and be improved upon. In concert with the administration's nonproliferation review, I am closely examining this as well as other Russian programs in order to maximize their effectiveness, and ensure they are operating in a manner consistent with national objectives and coordinated with other U.S. government nonproliferation activities.

It should be noted that to produce this report, the GAO review team obtained cost data from DOE headquarters and the National laboratories, reviewed NCI projects to determine their impact on program goals and objectives, and traveled to Russia to visit Sarov to meet with MinAtom officials. Finally, the GAO also met with proponents of the European Nuclear Cities Initiative. NNSA NCI program staff were active participants in this review, and we are prepared to implement any and all policy recommendations.

The report's focus on job creation as the primary measure of NCI program success differs from our perspective of the primary goal of the program, and does not fully appreciate U.S. experience with downsizing its own nuclear weapons complex. There are multiple measures of success and we are tracking and reporting on them. For example, NCI's performance metrics include facility downsizing, infrastructure upgraded or created, credits and investments provide to local businesses and so on.

The GAO report cites MinAtom official dissatisfaction with the amount of NCI funds spent in Russia. The bottom line on funding is that MinAtom officials would prefer that monies be provided directly to them, to carry out major projects as they see fit. This top-down central planning approach has failed Russia in the past and will continue to fail. In the United States, we have learned that successful economic diversification is based on an active partnership among government, industry and the community. We are attempting to pass on this knowledge and experience to our Russian colleagues by working directly with the cities and institutes.

In the initial start-up phase of the NCI program, the preponderance of funds were spent in the U.S. at the National laboratories. We relied on the labs to make the first contacts for the program since they had the ongoing, long-standing relationships. The labs also were integral in developing the projects jointly, and then providing the project oversight required. Now that the NCI program is entering a new phase, the role of the labs is being reduced and we anticipate meeting the congressionally-mandated 51 percent of funds spent in Russia in fiscal year 2001. We have instituted new processes, including financial reporting procedures that will help us meet that goal. Additionally, we have negotiated with some labs a reduction in their project management costs. Overall, lab activities will be reduced in coming years as the program attracts more commercial partners. We firmly believe that oversight of projects is important and that requires lab participation.

The GAO noted that some project funding proposals have been submitted to both NCI and IPP, in the hope of maximizing the chances of receiving funding. This does not indicate that the two programs are identical. All project proposals undergo a vigorous interagency vetting and review process to ensure, among other things, that scientists are not getting funded twice for the same work.

That said, I take the GAO observations and recommendations very seriously and thus tasked my management team to reexamine possible options for consolidating the NCI and IPP programs in an effort to achieve cost savings and other programmatic and administrative efficiencies. However, keep in mind this involves complex issues, and rather than rush to get the job done, I want to make sure that we do this right the first time. Therefore, I am waiting for the completion of the NSC reviews that are now underway, and the recommendations from my management team.

As we continue to move forward, I am confident that much-needed changes will occur. This is the nature of these types of programs. In fact, the IPP program, in its early years, experienced similar growing pains and was the subject of significant criticism. IPP has now become a successful program. We want to make sure that NCI is on a similar path. Furthermore, the U.S. Government's involvement will decrease over time, and business participation will grow. This increased role for business will lead the Russians toward self-sustaining civilian and commercial enterprises in the city, and provide the basis for the U.S. exit strategy. Our plans are to continue with a strong focus on Sarov.

Now, I would like to quickly touch on the rest of NNSA's nonproliferation programs. These programs address the issues of detecting, deterring, and impeding proliferation and the use of weapons of mass destruction. In addition to the programs already described, NNSA has extensive efforts in research and development (R&D) and arms control arenas. Our active role in the U.S. nonproliferation interagency community derives, in large measure, from the nuclear expertise found in the national laboratories. NNSA supports U.S. national, bilateral, and multilateral efforts to reduce the threat posed by the proliferation of weapons of mass destruction.

RESEARCH AND DEVELOPMENT PROGRAMS

A key nonproliferation strategy is to enhance the capability to detect weapons of mass destruction. The NNSA goal of integrating technical talent and policy expertise is evident in the Nonproliferation and Verification R&D Program, which enhances U.S. national security through needs-driven R&D, with an emphasis on developing technologies to detect nuclear, chemical, and biological proliferation, and to monitor nuclear explosions.

The following accomplishment is just one indication of the type of activities NNSA is involved with in the R&D area. NNSA is proud that, last year, we achieved a significant milestone in one of our R&D programs: The Multispectral Thermal Imager satellite was launched in March 2000. This small research satellite, designed and built by a team of NNSA laboratories and industry partners, will develop and test remote-sensing concepts that will add to our country's ability to monitor nuclear proliferation. The satellite has already achieved most of its design objectives.

The Proliferation Detection program will develop the requisite technologies to detect nuclear proliferation. Our unchallenged lead responsibility for nuclear nonproliferation technology derives from the expertise and knowledge base resident in our nuclear weapons complex, and it provides a technology template for the detection of activities related to all weapons of mass destruction. The objectives of the detection program are:

- to produce technologies that lead to prototype demonstrations and resultant remote proliferation detection systems,
- to strengthen our detection capabilities to respond to current and projected proliferation threats, and
- to develop technologies that are subsequently made available to a wide range of government users, including DOD and the intelligence community.

The separate, yet closely related, Proliferation Deterrence program seeks to develop technical options to prevent and deter proliferation of nuclear weapon technology and fissile materials. Research is focused on developing integrated sensor systems that will improve the accuracy and timeliness of information.

With the fiscal year 2002 budget, we will continue to develop and demonstrate innovative remote sensing, sampling, and analysis technologies needed to improve early detection of a proliferant nation's nuclear weapons program or non-compliance with international treaties and agreements, as well as tracking foreign special nuclear materials.

The Nuclear Explosion Monitoring Program is designed to provide the U.S. with the technical capability to detect nuclear explosions. Specifically, NNSA technical experts are working to develop and deploy sensors and algorithms that enable the U.S. to meet its national requirements for detecting, locating, identifying, and characterizing nuclear explosions in the atmosphere, in space, underground, or underwater.

To meet threats posed by chemical and biological agents, the NNSA draws upon the diverse and extensive expertise of its national laboratories. The goal of the Chemical and Biological National Security Program is to develop, demonstrate, and deliver technologies and systems that will lead to major improvements in U.S. capability to prepare for, and respond to, chemical or biological attacks against civilian populations. The NNSA is the primary agency developing non-medical technical solutions for this challenge. Our experts are involved in a broad interagency program to develop sensors that could detect the terrorist use of a biological agent at a large outdoor event, such as the Super Bowl or the Olympics.

ARMS CONTROL AND NONPROLIFERATION

Another key strategy is promoting arms control and nonproliferation treaties, promoting agreements, and regimes, and developing the associated technologies to support them. The mission of the Office of Arms Control and Nonproliferation is to detect, prevent, and reverse the proliferation of weapons of mass destruction (WMD) materials, technology, and expertise. It is the focal point within the NNSA for activities that support the President's nonproliferation and international security policies, goals, and objectives, as well as those activities mandated by statute. The program provides policy and technical expertise and leadership for NNSA and the Department in interagency, bilateral, and multilateral nonproliferation and international security matters. Several projects that had been initiated last year are not proceeding currently. The NNSA will not be proceeding with the Separated Civil Plutonium activities, due to Russian nuclear cooperation with Iran. Funding for Spent Fuel Storage and Geological Repository in Russia are on hold, to allow time for the new administration's interagency policy review.

NONPROLIFERATION PROGRAMS OUTSIDE OF RUSSIA

While the bulk of our nonproliferation activities take place in Russia, the NNSA is also involved in nonproliferation and arms-control-regime projects in many other parts of the world. For instance, since 1995, the U.S. and Kazakhstan have been working to reduce proliferation risks associated with three tons of weapons-grade plutonium. This material, which is located at the BN–350 fast-breeder reactor in Aktau, Kazakhstan, contains enough plutonium to manufacture hundreds of nuclear weapons. Furthermore, unlike most spent fuel, the majority the BN–350 spent fuel material poses no significant radiation hazard to a would-be thief. The project has reduced the threat to our national security posed by the vulnerability of the weapons-grade material. Further assistance to Kazakhstan, in implementing the secure long-term storage of the BN–350 plutonium-rich fuel, will be curtailed.

The Aktau project will continue to support the IAEA in the implementation of internationally accepted safeguards measures over the material, continue to provide non-weapons-related employment for nuclear scientists in Kazakhstan, and provide security and international safeguards measures for the transportation and long-term dry storage facility for the BN–350 material.

NNSA experts are also actively working in North Korea to reverse and prevent proliferation of nuclear weapons, by securing approximately thirty kilograms of weapon-grade plutonium contained in Nyongbyon 5 megawatt reactor spent fuel. Similar to the objectives of the Aktau project, NNSA technicians have:

- packaged the 8,000 assemblies in canisters and placed those canisters under IAEA monitoring, and
- performed field operations to maintain packaged spent fuel in a safe condition, appropriate for future shipment.

We are also supporting the IAEA in the implementation of verification and international safeguards of the material, while helping to prepare plans to support future shipment and disposition of spent fuel.

In an effort to impede the use of weapons of mass destruction, the NNSA supports several projects targeted at reducing the amount of fissile material that could be available to potential proliferators to fashion into a nuclear device. In the Reduced Enrichment for Research and Test Reactors (RERTR) Program, NNSA continues to work to reduce international commerce in civil HEU, by developing technologies to convert foreign and domestic research and test reactors from HEU to LEU.

NNSA is also active in strengthening regional security and nonproliferation, not only on the Korean peninsula, but also throughout East Asia, South Asia, and the Middle East. We are doing this by participating in U.S. policymaking, promoting regional security dialogues, and sharing with key states in these regions the expertise of the National laboratories on technical measures to implement nonproliferation agreements. Under a program to strengthen the Biological and Toxin Weapons Convention (BWC) regime, NNSA supports the U.S. in its efforts to negotiate a legally binding protocol to the 1972 BWC. This protocol is part of a larger effort to deter noncompliance with the BWC and to reinforce the global norm against the proliferation of biological weapons. Our technical experts facilitate U.S. commerce through implementation of bilateral peaceful nuclear cooperation agreements with our nuclear trading partners.

INTERNATIONAL NUCLEAR SAFETY AND COOPERATION

Another strategy for enhancing nuclear security is to improve operational safety and safety systems at nuclear facilities of concern. The NNSA is working to reduce safety risks at the 66 operating, Soviet-designed nuclear-power reactors in nine countries, through the International Nuclear Safety and Cooperation program. We plan to complete safety upgrades for these reactors by 2006. There are three reactors in Russia that are to be shut down, as part of DOD's program to eliminate the production of weapons-grade plutonium. These three high-risk reactors, at secured sites, are the oldest operating reactors in Russia, and have not received any safety upgrades under foreign cooperation. Safety upgrades at these production reactors, prior to their planned shutdown in 2006, are among our highest priorities. However, the scope of activities for improved safe operation will be limited.

We are encouraged not just by our progress to address nuclear safety at operating reactors, but by the early closure of older reactors as well. The Ukrainian government shut down Chornobyl's sole operational reactor in December 2000, as planned. Our efforts to support the construction of a replacement heat plant at Chornobyl, for decontamination and decommissioning purposes, are also proceeding well. We were pleased when Kazakhstan also made the tough decision to shut down its BN–350 reactor. Our attention is now focused on plans for decommissioning and decontaminating the reactor's sodium coolant, which will ensure that this reactor can never be restarted. The fiscal year 2002 budget request will allow us to complete one full-scope, nuclear plant training simulator, each, in Russia, Ukraine, and Slovakia. We will also strive for the completion of operational safety improvements at all plants in Russia and Ukraine. Safety procedure and reactor in-depth safety assessments will proceed, albeit at a delayed pace.

CONCLUSION

Mr. Chairman, I believe that NNSA is on the right course. The NNSA enjoys the strong support and endorsement of Secretary of Energy Spencer Abraham. It is the right idea to bring together the national security missions of DOE, and to focus our work with clear goals and plans, sharp lines of authority, and a strong view to the future.

The scientists and engineers that are stewards of our nuclear arsenal have also been making important technical contributions to controlling, detecting, and deterring the use of weapons of mass destruction. NNSA's unique contribution is evident in the caliber of personnel working on these complex, interrelated threat reduction programs. Their expertise resident in our national laboratories has been honed by years of working in support of the U.S. nuclear complex. Our technical experts are ready and willing to share their nonproliferation and counter-proliferation experience with their counterparts in Russia.

As a Nation, we may face no greater challenge than preventing weapons or weapons usable materials from falling into the hands of those who would use them against the U.S. or our allies. It has been more than a decade since the Berlin Wall fell, opening a new era in history. In many ways, we live in a more dangerous world now, since the demise of the Soviet Union. The threat to our safety and international security is more diffuse, which makes it harder to defend against. Rather than one monolithic threat, we must be prepared against rogue nations or terrorist organizations with interests inimical to ours. I am very proud of the nonproliferation programs that are rightfully part of the defense nuclear security enterprise. The review being conducted at the present time by the White House is timely and

I am confident it will reveal that the NNSA's programs are making solid contributions to the national security of the United States.

Again, I thank the members of this panel for their commitment and support of our mission, and for your support of the people of NNSA who actually do the work and accomplish the mission: scientists, engineers, technicians, policy planners, administrators, and so many others.

Senator ROBERTS. We've been joined by the distinguished Senator and Ranking Member of this subcommittee, Senator Landrieu, and I would turn to her for any opening comments that she would like to make.

STATEMENT BY SENATOR MARY L. LANDRIEU

Senator LANDRIEU. Thank you, Mr. Chairman, I want to welcome our panelists this afternoon to discuss this important program. I apologize for being a few minutes late.

I want to express that when Senators Nunn and Lugar had the foresight in 1991 to start this program to assist Russia with dismantling its nuclear weapons, protecting its weapons-usable materials plutonium and uranium, and engaging its weapons scientists and engineers to stop the spread of weapons of mass destruction, the U.S. was committed to a major challenge. Although much has been done along these lines and great efforts have been made, much more remains undone.

In January, a task force chaired by former Senator Howard Baker and White House Counsel Lloyd Cutler determined, "The most urgent unmet national security threat to the United States today is the danger that weapons of mass destruction or weapons-usable materials in Russia could be stolen and sold to terrorists or hostile nations and used against American troops abroad or citizens at home."

The task force went on to find that current nonproliferation programs in the Department of Energy, the Department of Defense, and related agencies have, in fact, achieved impressive results so far, but their limited mandate and funding fall short of what is required to address adequately this threat. We still have an opportunity to address these problems, but it's getting more difficult.

Moreover, there's concern that if we don't continue to move quickly, we may lose this opportunity completely.

Today we will hear from Ms. Jones, who will focus on the management issues arising from two of our programs. I look forward to her testimony.

As we discuss these issues, which are serious, I hope we don't lose sight of the ultimate goal of all of these programs, and that we identify how to move forward so that we continue this valuable effort.

Working with Russia is exceedingly difficult, and the DOE efforts are made even more difficult because they must occur in high security environments of closed cities. But there has been substantial success, and there will be more, if we don't collectively lose our will to preserve it.

We in Congress must commit to ensuring the success of these programs, they're in our national security interest, they are not Russian aid programs.

There's one specific issue I hope we can resolve by the end of this hearing, one of the nuclear cities projects has stopped because the

NNSA has not released money for the project. I hope, Mr. Chairman, by the end of this hearing we'll be able to identify a way to release the money for this project to close the Avangard weapons facilities. It's important to get this effort back on track.

I, again, welcome you all today. I look forward to your remarks, and I thank the chairman for calling the hearing.

Senator ROBERTS. Senator Allard, would you like to make any comment?

STATEMENT BY SENATOR WAYNE ALLARD

Senator ALLARD. Mr. Chairman, thank you for the opportunity. Just very briefly I want to recognize the great job that I think General Gordon is doing with the new agency. I've had a lot of respect for Ms. Jones. She's done some GAO studies in Colorado on Rocky Flats, and I think she's been very helpful in that regard. Just to recognize those two efforts, and I'll have some questions later on when we get around to questioning.

Senator ROBERTS. Thank you, Senator. Ms. Jones, please proceed. Your statement will be made part of the record as well as findings of your report.

STATEMENT OF MS. GARY L. JONES, DIRECTOR OF NATURAL RESOURCES AND ENVIRONMENT, U.S. GENERAL ACCOUNTING OFFICE

Ms. JONES. Thank you, Mr. Chairman, I appreciate that. We are pleased to be here today to discuss part of the results of our reviews of two of DOE's nonproliferation programs.

Our report on the Material Protection Control and Accounting program, or MPC&A, was issued in February. You have released our report on the Nuclear Cities Initiative (NCI) program today.

As part of our work, GAO teams traveled to Russia, including the closed City of Sarov, to review projects and talk with Russian scientists, institute directors, and government officials about both programs.

Our testimony focuses on the impact of and future plans for each program. From an overall standpoint, both programs are in our national security interests, but their implementation poses significant challenges.

The MPC&A program was initiated to help Russia protect the 603 metric tons of nuclear material that are in forms that are highly attractive to theft. This is important because it only takes a few kilograms to build a nuclear weapon.

Our report concluded that security systems installed by DOE are reducing the theft of nuclear material in Russia, but hundreds of metric tons of nuclear material still need improved security.

As of February, DOE had spent about $61 million to, among other things, install completed or partially completed systems that protect about 32 percent of the at-risk material.

However, DOE has not been allowed access to what Russia considers sensitive sites that contain several hundred metric tons of material because Russian officials are concerned that national security information would be divulged.

The program's continued progress depends on the success of DOE negotiations to gain access to these sensitive sites and reach agreement with Russia on reducing the numbers of sites and buildings where security systems are needed.

However, just installing security systems will not ensure long-term success. Our report noted that DOE has no mechanism to monitor the effectiveness of the installed security systems. But as General Gordon said, DOE has agreed to implement our recommendation to develop a monitoring system in cooperation with Russia.

Turning to DOE's Nuclear Cities Initiative, that program focuses on assisting Russia to downsize its nuclear weapons complex and create jobs for weapons scientists in the 10 closed nuclear cities that form the core of that complex. These cities are high security areas and access is very limited.

As they downsize the complex, Russian officials have identified a need to create 30,000 to 50,000 jobs in the cities over the next several years.

We found that during NCI's first 2 years of operation, the program has had limited success. According to DOE, the program employs about 370 people, including many Russian weapons scientists who primarily work part time on research projects sponsored by the U.S. national laboratories.

According to Russian officials, most of these scientists continue to work on Russia's weapons of mass destruction and also receive a salary from the Russian government.

Further, about one half of the program's projects are not designed to create jobs but rather include community development activities such as the delivery of medical equipment and school exchange programs.

Russian officials told us they did not want the community development projects because they didn't create jobs. Industry officials told us they were not relevant to their investment in the nuclear cities.

Other factors that have contributed to the limited programming success include lack of Russian support, until recently no comprehensive review process, the remote location of the cities, and the poor economic conditions in Russia.

With regard to funding, we found that a disproportionate amount of NCI program funds has been spent in the United States. About 70 percent of the $15.9 million that DOE spent through December 2000 was spent primarily in its national laboratories for such items as overhead, labor, equipment, and travel. The remaining 30 percent was spent for projects and activities in Russia.

DOE is making changes this fiscal year in response to congressional direction to spend 51 percent of program funds in Russia. But DOE will have to more effectively monitor and control spending to meet this goal.

Our report also raises a fundamental question for DOE. Does it need two programs with a shared common goal of employing Russian weapon scientists and, in some cases, implementing the same kinds of projects?

In addition, to NCI, DOE's Initiatives for Proliferation Prevention (IPP) also has projects in Russia's nuclear cities. There is some duplication between the two, such as two sets of project review procedures and several similar types of projects.

Further, IPP already had a presence in the nuclear cities before NCI was created. Since 1994, DOE has spent over $13 million on about 100 IPP projects in five nuclear cities.

We recommended and as General Gordon said DOE agreed to review whether these two programs should be consolidated into one effort to achieve potential cost savings and other efficiencies. Thank you, Mr. Chairman. I would be happy to respond to any questions.

[The prepared statement of Ms. Jones follows:]

PREPARED STATEMENT BY MS. GARY L. JONES

NUCLEAR NONPROLIFERATION—DOE'S EFFORTS TO SECURE NUCLEAR MATERIAL AND EMPLOY WEAPONS SCIENTISTS IN RUSSIA

Mr. Chairman and members of the subcommittee: We are pleased to be here today to discuss our reviews of two Department of Energy (DOE) nonproliferation programs that address important U.S. national security concerns—(1) improving the security of hundreds of tons of nuclear material at various sites throughout Russia and (2) employing weapons scientists in Russia's 10 closed nuclear cities so that they will not sell sensitive information to countries or terrorist groups trying to develop weapons of mass destruction. Both programs are managed by the National Nuclear Security Administration's Office of Defense Nuclear Nonproliferation. Our testimony focuses on each of these programs' impact and future plans. Our statement is based on our February 28, 2001, report on the Material Protection, Control, and Accounting (MPC&A) program and our report on the Nuclear Cities Initiative (NCI) program that is being released today.[1]

Mr. Chairman, the following summarizes our findings: The security systems installed by DOE are reducing the risk of theft of nuclear material in Russia, but hundreds of metric tons of nuclear material still lack improved security systems. As of February 2001, DOE had installed, at a cost of about $601 million, completed or partially completed systems protecting, among other things, 192 metric tons of the 603 metric tons of nuclear material identified at risk of theft. These systems, while not as stringent as those installed in the United States, are designed to prevent individuals or small groups of criminals from stealing nuclear material. Russian officials' concerns about divulging national security information continue to impede DOE's efforts to install systems for several hundred metric tons of nuclear material at sensitive Russian sites. The program's continued progress depends on DOE's ability to gain access to these sensitive sites and reach agreement with Russia on reducing the number of sites and buildings where nuclear material is located and security systems are needed. DOE agreed with our recommendation to develop options for completing the program on the basis of the progress made in gaining access to these sites and agreement on the closure of buildings and sites. Furthermore, while DOE currently does not have a means to monitor the security systems it is installing to ensure that they are operating properly on a continuing basis, the Department has agreed to implement our recommendation to develop such a system in cooperation with Russia. DOE estimates that the MPC&A program will be completed in 2020 at a cost of about $2.2 billion.

Regarding DOE's Nuclear Cities Initiative, we found that during its first 2 years of operation, the program had limited success. The Department estimates that the program employs about 370 people, including many weapons scientists who are primarily working on a part-time basis through research projects sponsored by the U.S. national laboratories. According to Russian officials, most of the scientists receiving program funds continue to work on Russia's weapons of mass destruction and are also receiving a salary paid for by the Russian government. About one-half of the program's projects focus on such activities as the delivery of medical equipment and school exchange programs and are not designed to create jobs for weapons scientists. With regard to funding, we found that a disproportionate amount of the NCI program's funding has been spent in the United States. About 70 percent, or about $11.2 million, of the $15.9 million that DOE spent through December 2000 was spent in the United States—primarily at its national laboratories—for such items as overhead, labor, equipment, and travel. The remaining 30 percent was spent for

[1] *Nuclear Nonproliferation: Security of Russia's Nuclear Material Improving: Further Enhancements Needed.* (GAO–01–312, Feb. 28, 2001) and *Nuclear Nonproliferation: DOE's Efforts to Assist Weapons Scientists in Russia's Nuclear Cities Face Challenges* (GAO–01–429, May 3, 2001).

projects and activities in Russia. DOE, in response to direction provided by Congress in a conference report on appropriations for fiscal year 2001, stated that its goal is to spend 51 percent of its program funds in Russia this fiscal year. DOE will have to more effectively monitor and control the program's spending to meet this goal. We also found that DOE's NCI program lacks a plan for the future. DOE agreed with our recommendations to develop a plan that addresses the program's future costs and a time frame with quantifiable performance measures to determine how effectively the program is meeting its goals and whether it should be expanded. DOE has two programs—NCI and the Initiatives for Proliferation Prevention (IPP)—operating in Russia's nuclear cities. We believe that DOE needs to address a fundamental question—does it need two programs with a shared underlying goal—employing Russian weapons scientists—and, in some cases, implementing the same kinds of projects? We recommended that DOE determine if these two programs should be consolidated into one effort to achieve potential cost savings and other efficiencies. DOE agreed to review both the IPP and NCI programs with a view toward consolidation.

BACKGROUND

In 1995, DOE established the MPC&A program to install improved security systems for nuclear material at civilian nuclear sites, naval fuel sites, and nuclear weapons laboratories in Russia. Terrorists and countries seeking nuclear weapons could use as little as 25 kilograms of uranium or 8 kilograms of plutonium to build a nuclear weapon. With the dissolution of the Soviet Union, DOE estimates that Russia inherited 603 metric tons of highly enriched uranium and plutonium in forms highly attractive to theft. As of February 2001, DOE had identified 252 buildings at 40 sites that require nuclear security systems. In addition to installing security systems, DOE is providing sites with long-term operational assistance through equipment warranties, operating procedure development, and training. DOE also has projects underway to help Russia's Ministry of Atomic Energy (MinAtom) and nuclear regulatory authority develop (1) a total inventory of nuclear material, (2) regulations to ensure the effective operation and maintenance of the systems, and (3) inspection and enforcement systems to ensure that sites comply with regulations. In addition, DOE is supporting security improvements for trains and trucks that transport nuclear material between and within sites and for nuclear material security training centers.

DOE's Nuclear Cities Initiative focuses on weapons scientists in the 10 closed nuclear cities that form the core of Russia's nuclear weapons complex. Many of these cities are located in geographically remote locations and were so secret that they did not appear on any publicly available maps until 1992. These cities remain high security areas and access to them is limited. MinAtom manages the nuclear facilities that are located within the cities and estimates that about 760,000 people live there, including approximately 122,000 residents who are employed in key nuclear enterprises. The Russian government has announced its intention to reduce the size of its nuclear weapons complex, and a critical component of this effort includes finding new employment opportunities for weapons scientists, engineers, technicians, and support staff who will lose their jobs from the downsizing of the complex. Russian officials have identified a need to create 30,000 to 50,000 jobs in the 10 closed nuclear cities over the next several years. DOE has tasked the National laboratories to play a major role in the program, which works in conjunction with another DOE program—the Initiatives for Proliferation Prevention—that also seeks to employ weapons scientists in several countries, including Russia.

DOE HAS REDUCED THE RISK OF THEFT FOR ABOUT 32 PERCENT OF THE NUCLEAR MATERIAL IN RUSSIA, BUT HUNDREDS OF METRIC TONS OF MATERIAL REMAIN UNPROTECTED

DOE has installed completed or partially completed security systems in 115 buildings holding about 192 metric tons, or about 32 percent, of the 603 metric tons of weapons-useable nuclear material at risk of theft in Russia. DOE installed completed systems in 81 buildings protecting about 86 metric tons (or about 14 percent) of nuclear material. DOE has also installed partially completed systems known as rapid upgrades in 34 additional buildings protecting 106 metric tons, or 18 percent of the nuclear material. Rapid upgrades consist of such things as bricking up windows in storage buildings; installing strengthened doors, locks, and nuclear container seals; and establishing controlled access areas around the nuclear material. Completed systems include such components as electronic sensors, motion detectors, closed circuit surveillance cameras, central alarm stations to monitor the cameras and alarms, and computerized material-accounting systems. By installing rapid upgrades, DOE helps Russian sites establish basic control over their nuclear material while U.S. project teams finish installing the security systems.

DOE's reviews of installed systems and our visits to nine nuclear sites in Russia indicate that most of the security systems are currently reducing the risk of theft. DOE has established a panel of experts known as the Technical Survey Team that examines project documents and meets with project teams to determine if the installed systems meet departmental guidelines for effectively reducing the risk of nuclear theft in Russia. From January 1999 through September 2000, the Technical Survey Team reviewed projects for 30 of the 40 sites in Russia. They found that systems at 22 of the sites were reducing the risk of theft by increasing the ability of the Russian sites to detect, delay, and respond to an attempted theft or otherwise strengthen control over their nuclear material. For six of the sites they reviewed, little or no risk reduction occurred because the systems were not installed in accordance with the guidelines, the teams did not have sufficient access to the buildings to install systems, or the systems were installed around material presenting a low risk of proliferation. For two of the other sites, it was too soon to tell if the systems reduced risk. DOE is taking steps to correct these problems.

At the nine sites we visited in Russia where DOE had installed systems, we observed, among other things,

- storage vaults equipped with strengthened doors, locks, video surveillance systems, and alarms that can detect and delay thieves as they attempt to steal nuclear material;
- nuclear material containers equipped with computerized bar codes and tamper-resistant seals that allow site personnel to perform quick inventories of the material and determine whether the containers were tampered with; and
- nuclear material portal monitors that scan people and vehicles entering and leaving facilities to ensure that they have not taken nuclear material from storage locations.

While DOE has made progress in installing systems, DOE's project teams do not have access to 104 of the 252 buildings requiring improved security systems. These buildings, located mostly at Russian nuclear weapons laboratories, contain hundreds of metric tons of nuclear material. MinAtom is reluctant to grant access to these buildings because of Russian national security concerns and Russian laws on the protection of state secrets. DOE officials told us they need access to these buildings to confirm the type of material to be protected, design systems that provide adequate protection for the material, ensure that the systems are installed properly, and ensure that the sites operate the systems properly. DOE recently reached a draft agreement with MinAtom to provide program personnel with greater access to sensitive MinAtom sites. According to DOE officials, even with the agreement, some of the more sensitive MinAtom sites will remain inaccessible to program personnel but the agreement, when concluded, will allow the program to further expand its work.

Just installing security systems will not ensure the long-term success of the MPC&A program. DOE's Technical Survey Team and our observations provide only a snapshot of how effectively the installed systems are reducing the risk of nuclear material theft in Russia. DOE has not established a means to systematically measure the effectiveness of the security systems that it has installed at Russian nuclear sites. However, DOE is currently collecting information from individual sites that would be useful in measuring the new systems' effectiveness. For example, DOE project teams visit sites and observe systems that have been installed, and at certain sites, DOE has contracts with the Russians to collect information on the functioning of equipment. In addition, before installing security systems, DOE and Russian site officials conduct vulnerability assessments, which assess the probability of the existing nuclear security systems at the sites to prevent nuclear material theft. In commenting on a draft of our report, DOE agreed with our recommendation to develop a system to monitor, on a long-term basis, the security systems at nuclear sites in Russia to ensure that they continue to detect, delay, and respond to attempts to steal nuclear material.

DOE FACES CHALLENGES IN ADHERING TO MPC&A PROGRAM'S COST PROJECTIONS AND TIME FRAMES

From fiscal year 1993 through February 2001, DOE spent about $601 million on the MPC&A program in Russia. DOE spent about $376 million, or 63 percent of the $601 million, on installing security systems at Russia's civilian sites, nuclear weapons laboratories, the Russian navy's nuclear fuel sites, and the Russian navy's nuclear weapons sites. DOE spent the remainder of the $601 million on, among other things, operational assistance and program management.

According to DOE, it will complete the MPC&A program in 2020 at a total cost of $2.2 billion. However, DOE officials told us that the cost estimate and time frame for completing the program are uncertain because DOE faces challenges in implementing the program. For example, DOE does not know how much assistance it will need to provide Russian sites with to operate and maintain the security systems. Some sites where DOE is installing systems are in better financial condition and have a greater potential to generate revenue than other sites and therefore are more likely to have the resources to maintain the security systems. Other sites will need more DOE assistance to maintain the systems. Furthermore, because of a lack of access to many nuclear sites, DOE is not certain about how many buildings will require security systems or when it will be able to start and complete the installation of these systems. DOE is also working with Russia to consolidate nuclear material into fewer buildings and convert the highly enriched uranium in these buildings into forms that cannot be used in nuclear weapons. While this effort could reduce the program's costs by reducing the number of sites and buildings needing systems, MinAtom has not yet identified which buildings and sites it plans to close. Our report (GAO–01–312) recommends that DOE include in its strategic plan, currently under development, (1) an estimate of how much assistance is required to sustain operations at each site on the basis of an analysis of the costs and the sites' ability to cover these costs and (2) options for completing the program on the basis of the progress made in gaining access to sensitive sites and the closure of buildings and sites. DOE concurred with this recommendation.

DOE'S NUCLEAR CITIES INITIATIVE PROJECTS HAVE HAD LIMITED IMPACT

During its first 2 years, NCI has had limited success in meeting the program's principal objectives—creating jobs for weapons scientists and helping to downsize Russia's weapons complex. According to DOE, the program is employing about 370 people, including many weapons scientists who are working primarily on a part-time basis through research projects sponsored by the U.S. national laboratories. About 40 percent of the work was generated through the Open Computing Center in the closed city of Sarov. The center's director told us that the part-time employees are also working at the weapons design institute in Sarov on weapons-related activities and are receiving salaries from the institute. The center has had some success in attracting business investment, and DOE officials estimated that, with successful marketing to commercial businesses, the center would be able to employ 500 people by 2005.

Although some jobs have been created, about one-half of the 26 NCI projects are not designed to create jobs for weapons scientists. Instead, these projects focus on, among other things, such activities as the delivery of medical equipment and school exchange programs. DOE officials told us that these community development projects are needed to make the nuclear cities more attractive to business investment. However, Russian officials have criticized the projects because they do not create jobs for weapons scientists, which they believe is the primary goal of NCI and the 1998 agreement between the United States and Russia. Furthermore, none of the industry officials we spoke with said that they would be more likely to invest in the nuclear cities because of municipal and social improvements in the nuclear cities.

Eight of the program's projects are designed to develop sustainable commercial ventures, but only one of these has successfully created jobs. Numerous factors have contributed to the limited success of the NCI projects. Some projects have been canceled or delayed because of the lack of Russian support and cooperation. Other reasons for these projects' lack of success include poor economic conditions in Russia, the remote location and restricted status of the nuclear cities, and the lack of an entrepreneurial culture among weapons scientists. Furthermore, DOE and national laboratory officials have told us that the Department's project selection process has been inconsistent and "ad hoc." According to the program director, projects were approved for funding without a comprehensive review process in order to implement the program quickly and engage the Russians. In January 2001, DOE issued new program guidance that includes more detail on project selection and approval. For example, the new guidance will give preference to those projects with the strongest prospects for early commercial success and those in which the start-up costs are shared with other U.S. government agencies, Russian partners, and/or private entities. While the guidance, if effectively implemented, will address the problems with DOE's inadequate project-selection process, it remains unclear to us why DOE took over 2 years to develop these procedures when similar procedures already existed under the IPP program.

Despite the numerous problems we found with the NCI projects, the program has made some strides. For example, according to DOE officials, one of the most successful projects involves the conversion of weapons assembly buildings at the Avangard weapons facility in Sarov into production space for commercial ventures, including the proposed establishment of a kidney dialysis manufacturing facility. The program has helped facilitate the relationship between a Western business and the Russian weapons institute, and DOE has allocated about $1.5 million to support this effort.

Interestingly, Mr. Chairman, the most successful commercial effort we observed in the nuclear cities involved a major U.S. computer firm that employs former weapons scientists in Sarov. This effort, which began about 7 years ago, has been undertaken without U.S. government assistance and now employs about 100 scientists. When we visited the software operation in September 2000, we were told that the employees work full-time and that their salaries are up to three times what they had been paid at the weapons institute.

MAJORITY OF NUCLEAR CITIES PROGRAM FUNDS HAVE BEEN SPENT IN THE UNITED STATES

From fiscal year 1999 through December 2000, the expenditures for NCI totaled about $15.9 million. Of that amount, about $11.2 million (or 70 percent) was spent in the United States, and about $4.7 million (or 30 percent) was spent for projects and activities in Russia. The U.S. national laboratories' costs to implement the program represented the bulk of the funds spent in the United States and included such items as overhead, labor, equipment, and travel. In fact, 75 percent of the funds spent by the laboratories were for overhead and labor costs. DOE officials told us that laboratory expenditures, although significant, were part of startup costs for NCI. They noted that the program has taken longer to start up because of the economic problems facing Russia and the barriers involved in trying to start new businesses and related activities in the nuclear cities. DOE officials told us that they were concerned about the amount of funds spent by the laboratories to administer the program—particularly the overhead costs—and have taken steps to reduce these costs such as by managing some projects directly from headquarters. These officials also told us that laboratory costs will be reduced and that the laboratories' role will diminish as commercial investors develop business contacts in the nuclear cities as a result of the program.

The $4.7 million in expenditures for Russia included contracts with Russian organizations to buy computers and other equipment, a small business bank loan program, and various community development projects. Furthermore, MinAtom officials made it clear to us, during our September 2000 visit to Russia, that they were dissatisfied with the amount of program funds that had been spent in Russia. The First Deputy Minister of MinAtom told us that it was his understanding that DOE planned to spend the majority of program funds in Russia and wanted to know what happened to these funds. He said that the lack of progress in the program increases the negative views of the program held by various Russian government officials, who allege that the program is a way for the United States to gain access to weapons data in Russia's nuclear cities.

In response to direction provided by Congress in a conference report on DOE's fiscal year 2001 appropriations, DOE stated that its goal is to spend at least 51 percent of its program funds in Russia during this fiscal year. DOE will have to more effectively monitor and control the program's spending to meet this goal. Regarding future program expenditures, the Department has not developed a plan that addresses the program's future costs and a time frame with quantifiable performance measures to determine how effectively the program is meeting its goals and when and if the program should expand beyond the three nuclear cities. In 1999, DOE officials believed that the total funding level for NCI could reach $600 million over a 5-year period. However, the program's director told us that because the program had not received expected funding levels during its first years of operation, he is uncertain about the program's future costs and time frames.

DUPLICATION HAS OCCURRED IN THE OPERATION OF DOE'S TWO PROGRAMS IN RUSSIA'S NUCLEAR CITIES

DOE has two programs operating in Russia's nuclear cities—the Nuclear Cities Initiative and the Initiatives for Proliferation Prevention—that share a common underlying goal—to employ Russia's weapons scientists in nonmilitary work. We believe that DOE needs to address a fundamental question—does it need two programs operating in Russia's nuclear cities with a shared goal and, in some cases, the same types of projects? The operation of these two similar programs has led to some duplication of effort, such as two sets of project review procedures and several similar types of projects. Both programs provide Russia's nuclear cities with funds and since 1994, DOE has spent over $13 million on about 100 IPP projects in five nuclear cities, including the three nuclear cities participating in NCI—Sarov, Snezhinsk, and Zheleznogorsk. One U.S. national laboratory official told us that there was not a clear distinction between the two programs, and other laboratory officials noted that some projects have been proposed for funding under both programs, have been shifted from one program to another, or have received funding from both programs. The IPP program director told us that although he did not believe that the two programs were duplicative, there is a potential for duplication to occur because both have a common approach for creating jobs in the nuclear cities. Both programs reside within DOE's Office of Defense Nuclear Nonproliferation, National Nuclear Security Administration; have adjoining offices; and share staff to perform budget, travel, and secretarial functions.

Our work shows that some of the failures of NCI's commercial development projects might have been avoided if DOE had a common project approval process and incorporated some of the elements of the IPP project selection process from the onset of the NCI program. Furthermore, most of NCI's initial commercial development projects would not likely have been approved under the IPP program's more rigorous approval process. This is because, unlike the IPP program, NCI did not require that projects have industry partners or demonstrate commercial viability until January 2001, when program guidance was issued. In addition, NCI has recently (1) begun to develop a more systematic process, as IPP already has, for obtaining the views of business or industry experts on commercial development and (2) adopted practices established under the IPP program regarding the funding of projects. In commenting on a draft of our report being released today, DOE agreed to review both programs with a view toward consolidation.

Mr. Chairman, this concludes our testimony. We would be happy to respond to any questions that you or other members of the subcommittee may have.

CONTACT AND ACKNOWLEDGEMENT

For further information on this testimony, please contact Ms. Gary L. Jones at (202) 512–3841. Individuals making key contributions to this testimony included Gene Aloise, Charles Bolton, Ross Campbell, Joseph Cook, Glen Levis, and Joseph O. McBride.

United States General Accounting Office

GAO

Report to Congressional Requesters

February 2001

NUCLEAR NONPROLIFERATION

Security of Russia's Nuclear Material Improving; Further Enhancements Needed

GAO

Accountability * Integrity * Reliability

GAO-01-312

Contents

Abbreviations

DOE	Department of Energy
GAN	Gosatomnadzor (The Federal Nuclear Radiation Safety Authority)
GAO	General Accounting Office
MINATOM	Ministry of Atomic Energy (Russia)

GAO
Accountability * Integrity * Reliability

United States General Accounting Office
Washington, DC 20548

February 28, 2001

The Honorable John W. Warner
Chairman, Committee on Armed Services
United States Senate

The Honorable Pat Roberts
Chairman, Subcommittee on
Emerging Threats and Capabilities
Committee on Armed Services
United States Senate

Safeguarding nuclear material that can be used in nuclear weapons is a primary national security concern of the United States and Russia. Terrorists and countries seeking nuclear weapons could use as little as 25 kilograms of highly enriched uranium or 8 kilograms of plutonium to build a nuclear weapon. With the dissolution of the Soviet Union, it is estimated that Russia inherited 603 metric tons of highly enriched uranium and plutonium in forms highly attractive to theft. This amount of material is enough to produce almost 40,000 nuclear bombs. The breakdown of Soviet-era control systems, coupled with social and economic deterioration within Russia, has increased the threat of this material's theft or diversion.

Since the early 1990s, the United States has been working cooperatively with Russia to install nuclear security systems at its nuclear sites. In 1995, the Department of Energy (DOE) established the Material Protection, Control, and Accounting program to install improved security systems for nuclear material at civilian nuclear sites, naval fuel sites, and nuclear weapons laboratory sites in Russia.[1,2] As of February 2001, DOE officials had identified 252 buildings at 40 sites in Russia that require nuclear

[1]The National Nuclear Security Administration's Office of Defense Nuclear Nonproliferation manages the Material Protection, Control, and Accounting program. The National Nuclear Security Administration was established by the Congress on March 1, 2000, as a semiautonomous agency within DOE with responsibilities for the nation's nuclear weapons, nuclear nonproliferation activities, and naval reactor programs.

[2]According to DOE, these sites are nuclear facilities that have a guarded perimeter and one or more buildings with weapons-usable nuclear material. In the Russian naval sector, sites include ships used to store nuclear fuel. In the nuclear weapons complex, sites include 10 "nuclear cities" located throughout Russia.

security systems. Through direct contracts between its national laboratories and the Russian sites, DOE provides funding for the security improvements.[3] Project teams consisting of nuclear security experts from the national laboratories work with their Russian counterparts to design and install the improved security systems. In 1998, DOE issued guidelines that provide criteria for effectively reducing the risk of nuclear material theft in Russia.[4] The criteria specify the types of security improvements needed on the basis of threat assessments developed for each of the sites in Russia. By following the criteria, DOE plans to install security systems that reduce the risk of theft as quickly as possible at these sites. While the systems being installed are not as stringent as those in the United States, they are designed to prevent individual employees or a small group of criminals from stealing nuclear material. The Department has established a panel of experts, known as the Technical Survey Team, to determine if the installed systems meet the Department's criteria for effectively reducing the risk of nuclear material theft at a site. The Team conducts its reviews by examining project documentation and meeting with the project team that designed and installed the systems but does not generally visit the Russian sites.

This is the second of two reports we have issued addressing your request to assess DOE's Material Protection, Control, and Accounting program.[5] This report addresses (1) if the nuclear security systems are reducing the risk of theft and how DOE is measuring their effectiveness; (2) what DOE is doing to ensure that Russia operates and maintains the improved security systems over the long run; and (3) DOE's plan for completing the program.

[3]DOE manages 23 national laboratories. Originally created to design and build atomic bombs under the Manhattan Project, these laboratories have since expanded to conduct research in many disciplines—from high-energy physics to advanced computing at facilities throughout the nation. Ten national laboratories participate in the program, including: Argonne, Brookhaven, Lawrence Livermore, Pacific Northwest, Oak Ridge, Los Alamos, Sandia, New Brunswick, Savannah River, and Pantex.

[4]"Guidelines for Material Protection, Control, and Accounting Upgrades at Russian Facilities" (Dec. 1998).

[5]The first report, *Nuclear Nonproliferation: Limited Progress in Improving Nuclear Material Security in Russia and the Newly Independent States* (GAO/RCED/NSIAD-00-82, Mar. 6, 2000), provided information on the cost of the program and how much progress the program had made in installing new nuclear security systems in the former Soviet Union.

Results in Brief

The security systems installed by the Department of Energy are reducing the risk of theft of nuclear material in Russia, but hundreds of metric tons of nuclear material still lack improved security systems, and the Department has no mechanism in place to monitor the effectiveness of the systems once they are installed. As of February 2001, the Department had installed completed or partially completed security systems in 115 buildings protecting about 32 percent of the 603 metric tons of weapons-usable nuclear material identified as being at risk of theft or diversion from Russia. The Department installed completed systems in 81 buildings protecting about 86 metric tons, or about 14 percent, of the nuclear material. The Department has also installed partially completed security systems, known as *rapid upgrades*, in 34 additional buildings protecting about 106 metric tons, or 18 percent, of the nuclear material. According to the Department, the program has work underway on an additional 130 metric tons of nuclear material. The Department's Technical Survey Team found that the majority of the security systems are being installed in a manner that is reducing the risk of nuclear material theft. During our visits to nine sites, we observed, among other things, nuclear material storage vaults equipped with strengthened doors, locks, video surveillance systems, and alarms that can detect and delay thieves as they attempt to steal nuclear material. We also observed instances where systems were not operated properly. For example, at one nuclear facility that we visited, an entrance gate to a building containing nuclear material was left open and unattended by guards. While the Department has made progress in installing security systems at Russian sites, hundreds of metric tons of nuclear material remain unprotected. Because the Russian Ministry of Atomic Energy has restricted the Department's access to some nuclear weapons laboratories and civilian sites, the Department is not installing security systems in 104 buildings containing hundreds of metric tons of material that it has identified as needing improved security systems. While the Technical Survey Team's reports and our visits indicate that the security systems as installed are currently reducing the risk of theft, the Department does not have a system in place to monitor the systems on a long-term basis to ensure that they continue to detect, delay, and respond to attempts to steal nuclear material. The Department is currently collecting from individual sites information that would be useful for such a system. This report recommends the development of a system to monitor the sites to ensure that the security systems are working as designed.

In addition to installing security systems, the Department is providing sites with long-term assistance through equipment warranties, operating procedure development, and training. The Department also has projects under way to help Russia's Ministry of Atomic Energy and nuclear regulatory authority develop (1) a nuclear material accounting database that will enable Russia to track its total inventory of nuclear material; (2) regulations to ensure effective operations and maintenance of the systems; and (3) an inspection and enforcement system to ensure that sites comply with regulations. In addition, the Department is supporting security improvements for trains and trucks that transport nuclear material between and within sites and for nuclear material security training centers. While some progress has been made on these projects, the Department does not expect them to be completed before 2020. To sustain the improved security systems, the Department estimates that it may have to assist each site for up to 3 years, or possibly longer, after the systems are installed.

In response to our March 2000 report, the Department developed a cost estimate and time frame for completing the Material Protection, Control, and Accounting program. The Department estimated that the total cost of the program through 2020 will be about $2.2 billion. This estimate includes $823.1 million to complete installation of nuclear material security systems by fiscal year 2011, $711.8 million for assistance to Russia to support and operate the security systems through 2020, and $241.3 million for program management. Department officials expressed uncertainty about the cost estimate and time frame for completing the program because of a number of issues that could delay the program or affect its costs. For example, the estimate also includes $387.2 million for consolidating the nuclear material into fewer buildings and converting some of the material into a form that cannot be used for weapons. While this initiative could reduce program costs by reducing the number of buildings needing security systems, the Russian Ministry of Atomic Energy has yet to identify which buildings and sites it plans to close. The Department is currently developing a strategic plan for achieving its goals for reducing the risk of theft in Russia and managing the program's operations. This report recommends that the plan include (1) an estimate of how much assistance is required to sustain the operations of the systems based on an analysis of the costs and the sites' ability to cover these costs and (2) options for completing the program on the basis of the progress made on gaining access to sensitive sites and the closure of buildings and sites.

We presented a draft of this report to the Department. The Department generally agreed with our findings and concurred with our recommendations. The Department also provided technical clarifications, which we incorporated where appropriate.

Background

According to DOE, 603 metric tons of highly enriched uranium and plutonium are at risk of nuclear material theft in Russia. This material, located at civilian research centers, naval fuel storage sites, and Russia's nuclear weapons laboratories, can be used directly in a nuclear weapon without further enrichment or reprocessing. The material is considered to be highly attractive to theft because it (1) is not very radioactive and therefore relatively safe to handle and (2) can easily be carried by one or two people in portable containers or as components from dismantled weapons. The dissolution of the Soviet Union in 1991 and the subsequent social, political, and economic changes in Russia weakened the existing Soviet-era nuclear security systems. These systems placed a heavy emphasis on internal surveillance of nuclear workers and citizens and severe penalties for violations of nuclear security. The decline in economic conditions, late payment of wages to nuclear workers, and the rise of a strong criminal element increased the risk that employees or criminal elements in Russia would attempt to steal nuclear material for economic gain. Furthermore, Russian nuclear facilities lacked modern equipment that could quickly detect, delay, and respond to attempted thefts of nuclear material.

Over the last 7 years, DOE has worked cooperatively with Russia to install modern nuclear security systems consisting of three components:

- Physical protection systems, such as fences around the buildings that contain nuclear material; metal doors protecting the rooms where material is stored; and video surveillance systems that monitor the storage rooms.
- Material control systems, such as seals attached to nuclear material containers that indicate whether material may have been stolen from the containers and badge systems that only allow authorized personnel into areas containing nuclear material.
- Material accounting systems, such as inventories of nuclear material and computerized databases that enable sites to track the amount and type of nuclear material contained in specific buildings.

DOE's Guidelines for Material Protection, Control, and Accounting Upgrades at Russian Facilities provide U.S. project teams with criteria for designing and installing security systems. The criteria were designed to achieve the greatest reduction to the risk of nuclear material theft within the program's projected budget. While the guidelines are based on DOE's physical security and material control and accounting requirements, and the International Atomic Energy Agency's recommendations for physical protection, they are not as stringent as U.S. and international standards used to protect material at similar kinds of sites. According to the guidelines, installing security systems that use multiple components reduces the risk of theft by minimizing the reliance on any one component to detect and delay attempted thefts. Locating the components close to the material, such as around storage vaults and work areas, rather than at a site's perimeter also reduces risk by minimizing the chance that a thief can bypass security systems and steal material. The guidelines also establish priorities for installing security systems on the basis of how easily the nuclear material being protected could be converted to nuclear weapons. Material that is more readily converted to nuclear weapons receives more extensive security systems than material that poses less of a proliferation risk. DOE is also placing a priority on countering lower-level threats of theft from nonviolent individual employees or a small group of criminals rather than from higher-level threats such as those from violent employees or terrorists equipped with explosives to maximize the amount of material that can be protected within the program's budget.

DOE's Technical Survey Team reviews project documentation and meets with project team members to ensure that the installed systems meet DOE's guidelines for reducing the risk of nuclear material theft in Russia. The Team comprises eight national laboratory personnel with expertise in physical protection systems and material control and accounting for nuclear materials. The Technical Survey Team's reviews include (1) an estimate of the original risk of theft at the site and how the installed security systems will reduce it; (2) the extent to which project activities have reduced the risk of theft at the site, on the basis of completed systems or other risk-reduction activities; and (3) the extent to which the security systems are balanced with appropriate physical security and material control and accounting equipment and procedures. The Team also reviews the project work plans for each site at the beginning of the fiscal year to ensure that project teams are installing systems that are effective and are of the least cost.

DOE Has Reduced the Risk of Theft for 32 Percent of the Nuclear Material in Russia, but Hundreds of Metric Tons of Nuclear Material Still Lack Improved Security Systems

DOE installed completed and partially completed security systems in 115 buildings with about 32 percent of the 603 metric tons of weapons-usable nuclear material. We found that the systems that were installed are reducing the risk of nuclear material theft in Russia. DOE is not installing security systems in 104 buildings because Russia's Ministry of Atomic Energy (MINATOM) has restricted access to buildings containing several hundred metric tons of nuclear material because of Russian national security concerns. DOE currently does not have a system in place to periodically measure the effectiveness of the systems to ensure that they continue to detect, delay, and respond to attempts to steal nuclear material.

Installed Systems Are Reducing the Risk of Theft for 192 Metric Tons of Nuclear Material

As of February 2001, DOE had installed completed and partially completed security systems in 115 buildings with about 192 metric tons, or about 32 percent, of the 603 metric tons of weapons-usable nuclear material. DOE installed completed systems in 81 buildings protecting about 86 metric tons, or about 14 percent, of the nuclear material. DOE has also installed partially completed security systems known as *rapid upgrades* in 34 additional buildings protecting about 106 metric tons, or about 18 percent of the nuclear material. According to DOE, rapid upgrades consist of such things as bricking up windows in storage buildings; installing strengthened doors, locks, and nuclear container seals; establishing controlled access areas around nuclear material; and implementing procedures requiring two people be present when nuclear material is handled. By installing rapid upgrades, DOE helps Russian sites establish basic control over nuclear material while U.S. project teams finish installing the security system. DOE officials consider a system to be completed when it includes such components as electronic sensors, motion detectors, and closed circuit television systems to detect intruders; central alarm stations, where guards can monitor cameras and alarms; and computerized material accounting systems. According to DOE, the program also has work under way on an additional 130 metric tons of nuclear material.

Table 1 shows the number of buildings and types of sites where completed nuclear security systems have been installed, where rapid upgrades have been installed, where work has started but rapid upgrades have not been completed, and where work has not yet started.

Table 1: Status of Nuclear Security System Installations as of February 2001

Status	Buildings at Russian civilian sites	Buildings at Russian naval nuclear fuel sites	Buildings at Russian nuclear weapons laboratories	Total
Completed systems	51	21	9	81
Rapid upgrades	8	3	23	34
Work started	11	11	46	68
No work started	19	1	49	69
Total	89	36	127	252

Note: The table does not include the status of nuclear security systems installed by DOE at Russian Navy nuclear weapons storage sites. See appendix I for information on DOE's program to install security systems at these sites. See appendix II for information on the status of installed systems at Russian civilian, naval fuel, and nuclear weapons sites.

Source: DOE.

Our assessment that the installed systems are reducing the risk of nuclear material theft is based on the Technical Survey Team's reviews of the security improvements at Russian sites, our visits to nine sites, and our discussions with DOE and Russian officials responsible for installing the systems.

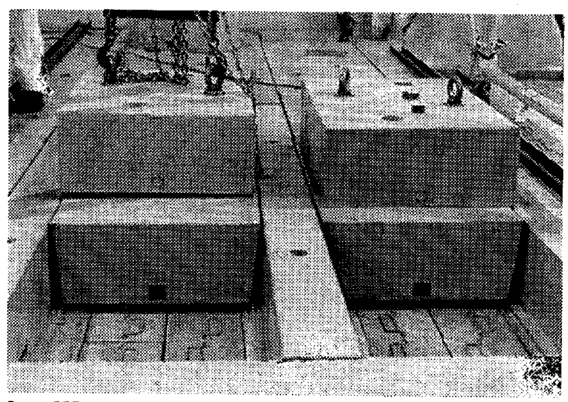
From January 1999 through September 2000, the Technical Survey Team reviewed projects at 30 of the 40 sites with nuclear material in Russia.[6] Of the 30 sites reviewed, the Team found that the security systems installed or being installed for 22 sites are reducing the risk of theft. Specifically, the systems increased the site's ability to detect, delay, and respond to an attempted theft or otherwise strengthened control over their nuclear materials at all times. To evaluate the projects, the Team used DOE's criteria and determined (1) whether the project teams installed security systems on the basis of how easily the nuclear material being protected could be converted to nuclear weapons, (2) whether the systems were installed close to the nuclear material rather than at the sites' perimeter, and (3) whether multiple components were installed to minimize reliance on any one component to prevent theft. The following are examples where

[6] Of the 10 sites not reviewed, 4 were nuclear weapons assembly and disassembly sites where DOE is not currently installing systems because it does not have access to the sites, and 5 were small Russian research sites where systems were installed prior to 1998 when DOE issued its program guidelines for installing systems. DOE does not believe that a Technical Survey Team review for these sites is as high a priority as that for the sites where systems are currently being installed. In addition, as of February 1, 2001, the Team had not completed its review of a Russian Navy fuel site (Site 86).

the Technical Survey Team found that the systems as installed are reducing the risk of nuclear material theft:

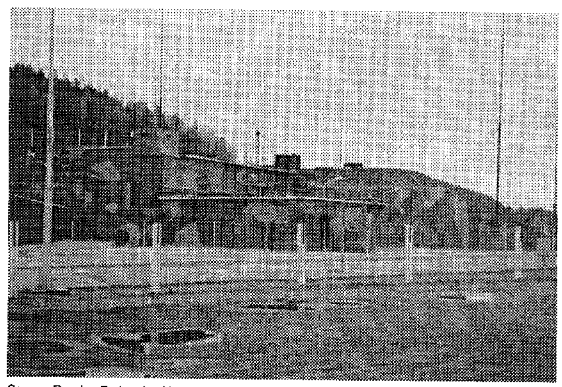
- At the Mayak Production Association, a major producer of plutonium for Russia's nuclear weapons program, DOE installed 1-ton interlocking concrete blocks over trenches containing over 5,000 containers of plutonium. (See fig. 1.) As of February 2001, the blocks were protecting over 15 metric tons of plutonium. Each container has a computerized bar code and tamper-resistant seal to help the site track its location and to show if any attempts have been made to open the container. Each block provides a barrier to delay a thief from gaining access to the material before being detected. In addition, the site's ability to detect and respond to an attempted theft is reinforced with additional sensors, surveillance cameras, alarms, and communications systems. According to the Technical Survey Team, the blocks are effective against an adversary using sophisticated methods.
- At Navy Fuel Storage Sites 49 and 34 (located in Murmansk and Vladivostok, respectively), DOE helped the Russian Navy construct storage complexes to consolidate tens of tons of nuclear reactor fuel that were located in poorly protected sites in the Northern and Pacific Fleets. (Navy Site 49 is shown in fig. 2.) DOE, working with the Russian Navy, strengthened the walls and ceilings of the nuclear storage buildings and installed portal monitors for nuclear material, which scan people and vehicles entering and leaving facilities to ensure that they have not taken nuclear material from storage locations, video surveillance systems, alarms, and fences to increase the ability to detect a theft. In addition, DOE improved the guard forces' ability to respond to an attempted theft by providing them with helmets, bulletproof vests, strengthened barriers that protect against gunfire, and a radio communication system. According to the Technical Survey Team, the systems have significantly reduced the risk of nuclear material theft at these sites.
- At the Institute of Physics and Power Engineering at Obninsk, DOE bricked up windows at several buildings that contain several tons of nuclear material and installed high-security vault doors and locks and access control systems. According to the Technical Survey Team, these measures reduce the risk of theft. The project team also developed an inventory strategy that reduced the time it takes to inventory items and encouraged the facility to place nuclear material that it seldom uses in sealed containers. According to the Team, these security improvements are consistent with the guidelines issued by the program.

Figure 1: Blocks Used to Protect Plutonium at the Mayak Production Association



Source: DOE.

Figure 2: Russian Navy Site 49



Source: Russian Federation Navy.

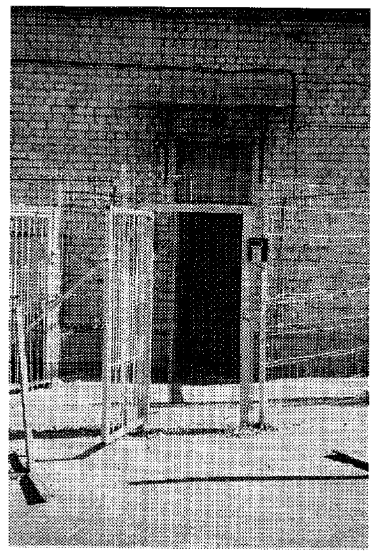
At six of the eight remaining sites, the Technical Survey Team's reports indicated that activities undertaken to install security systems had achieved little or no risk reduction so far, while at the two remaining sites, it was too soon to tell if the systems were reducing risk. At two of the six sites (the Petersburg Nuclear Physics Institute and the Bochvar Institute), the systems that were installed did not meet the criteria for reducing risk because they were installed at the perimeter of the sites rather than close to the material. DOE's project teams are currently taking actions to correct the problems. At two other sites—Sarov (also known as Arzamas-16, the primary nuclear weapons design laboratory in Russia) and Elektrostal (a MINATOM facility that fabricates reactor fuel rods of highly enriched uranium for the Russian Navy)—project teams did not have sufficient access to buildings to install systems in accordance with the guidelines. At Sarov, the project team gave Sarov personnel security system components to install in some of the buildings where the project team did not have physical access. However, according to the Technical Survey Team, while incremental improvements to security have occurred at Sarov, the risk of nuclear material theft remains high. At Elektrostal, DOE project teams were limited to providing security improvements only for low enriched uranium, which poses a low risk of proliferation if stolen. Because of the project team's lack of access to buildings with highly enriched uranium, the program has decided not to enter into any new contracts at the site until access issues are resolved. At Tomsk-7, the team did not verify the type of material it was protecting and installed systems around material that, according to the Technical Survey Team, presented little proliferation risk. At the Lytkarino Research Institute of Scientific Instruments, the strengthened doors installed as part of the site's rapid upgrades were ineffective, and according to the Team, needed to be replaced.

In order to observe how the nuclear security systems are reducing the risk of theft in Russia, we visited nine nuclear sites in Russia where DOE installed systems. During our visits, we toured buildings where the installation of nuclear security systems was complete as well as buildings where work was ongoing or had not been started. We also discussed how the nuclear security systems were working with the Russian site officials and U.S. project team members who accompanied us on the tours. We saw site personnel demonstrate how they use the security systems, and we observed the multiple systems designed to detect or delay an outsider or employee attempting to steal material. The officials at the sites that we visited also showed us nuclear material storage rooms as well as rooms where employees work with the material. We observed the following systems and concluded that they were reducing risk:

- Storage vaults equipped with strengthened doors, locks, video surveillance systems, and alarms that can detect and delay thieves as they attempt to steal nuclear material.
- Central alarm stations where guards monitored the video surveillance systems. The guards were equipped with communications equipment to respond to alarms.
- Nuclear material containers equipped with computerized bar codes and tamper-resistant seals that allow site personnel to perform quick inventories of the material and determine whether containers were tampered with.
- Access and exit procedures that ensure that only authorized personnel are allowed into areas with nuclear materials.
- Nuclear material portal monitors that scan people and vehicles entering and leaving facilities to ensure that they have not taken nuclear material from storage locations.

However, at three sites, we also observed some problems that appeared to decrease the effectiveness of the new systems. For example, one site left a gate to its central storage facility open and unattended during the day. (See fig. 3.) According to a site official, the gate is left open to allow employees to enter and leave the facility without having to use the combination locks on the gate. When the gate is open, the only other controlled access point is at the perimeter of the site. At another site that we toured, the guards did not respond to metal detectors that were set off when we entered the site, nuclear material portal monitors were not working, and alarm systems had exposed cabling that could allow an adversary to cut the cable and disable the alarm easily. At the third site, DOE had provided heavy metal containers that could be bolted to the floor to make it more difficult for an individual to gain access to the material. But some of the containers were empty, and instead, the site stored material in old containers that did not offer as much protection. In addition, this site did not have access controls, such as metal detectors or nuclear material portal monitors at locations where nuclear material is stored, and the guards did not check the identification of people entering the storage areas. More information on the sites that we visited can be found in appendix III.

Figure 3: Gate Left Open and Unattended at a Russian Nuclear Facility



DOE Is Not Installing Systems in Many Buildings Because of Access Problems

As of February 2001, DOE was not installing systems in 104 buildings because the U.S. project teams did not have physical access to the buildings. These buildings, mostly located at Russian nuclear weapons laboratories, contain hundreds of metric tons of nuclear material. According to DOE officials, physical access is needed to (1) confirm the type of material to be protected, (2) design systems that provide adequate security for the material to be protected, (3) ensure that equipment is installed properly, and (4) ensure that the sites operate the systems properly and use equipment for the intended purpose. MINATOM is reluctant to grant DOE project teams physical access to the buildings because of Russian national security concerns and Russian laws on the protection of state secrets. For example, rather than allow project teams into buildings where they can determine what security systems are needed, some sites have allowed the project teams only to view the site perimeters. Consequently, the project teams do not obtain enough information on the buildings—for example, information on the type of material and how easy it would be to convert the material into a nuclear weapon—which determines the type of security systems that DOE would install. Because it lacked physical access, in September 1999, DOE suspended new work at six of the nuclear weapons laboratories—Sarov, Snezhinsk (also known as Chelyabinsk-70), and the four nuclear weapons assembly and disassembly sites.[7] Table 2 shows the status of DOE's physical access to buildings by program sector.

Table 2: Number of Buildings Where Russia Has Not Granted Physical Access to U.S. Project Teams

	Russian civilian sites	Russian naval nuclear fuel sites	Russian nuclear weapons laboratories	Total
Total number of buildings	89	36	127	**252**
Number of buildings where teams have physical access	78	36	34	**148**
Number of buildings where teams do not have physical access	11	0	93	**104**
Percentage of buildings where teams do not have physical access	12%	0%	73%	**41%**

Source: DOE.

In January 2000, DOE issued new guidance to project teams on access to sites. Under the new guidance, physical access is still the preferred means to identify nuclear material that needs protection and to design and install security systems. However, if the Russian site officials do not grant physical access to the project team, DOE officials may pursue alternative means of providing assurances if the alternatives are acceptable to site officials and DOE approves of the alternative. According to the guidance, alternative means of providing assurances may include a combination of photographs and videotapes of areas before and after the installation of security systems, a visual inspection by a single member of the project team, and written certifications by site directors. Once DOE approves the alternate means for providing assurances, it is incorporated into the access provisions that become part of the contract with the site for installing security systems. According to a DOE official, DOE pays only for

[7] According to a DOE official, work under contracts with the sites prior to September 1999 continues, but no new contracts have been signed.

work performed under the contract once it receives the assurances obtained as stipulated in the access provisions of the contract. DOE officials are currently testing this approach in pilot programs with Sarov and Snezhinsk for work at sensitive buildings at the sites but it has not yet reached any such agreements under the new access guidance.

DOE has also reached a draft agreement with MINATOM to provide program personnel with greater access to sensitive MINATOM sites. This agreement is undergoing interagency review in the executive branch. According to DOE, while some of the more sensitive areas at MINATOM's nuclear facilities may remain inaccessible to program personnel, this agreement will allow the program to further expand its work once it is concluded.

DOE Does Not Have a Mechanism to Assess the Systems' Operational Effectiveness

DOE has not established a means to systematically measure the effectiveness of the security systems that it has installed at Russian nuclear sites. The Technical Survey Team's and our observations provide only a snapshot of how effectively the installed systems are reducing the risk of nuclear material theft in Russia. The new security systems' ability to reduce the risk of theft also depends on whether the site personnel operate the systems on a continuing basis; follow administrative procedures associated with controlling access to material; maintain systems such as alarms, sensors, and television surveillance cameras; and test equipment and procedures periodically.

In 1997, DOE asked Lawrence Livermore National Laboratory to develop measures to determine the systems' effectiveness. Lawrence Livermore ultimately developed a measurement system that looked at 30 elements that make up an effective security system, such as access controls, intrusion detection, the testing of electronic security and alarm systems, and the functioning of the guard forces. The measurement system was designed to provide a baseline to measure progress; identify weaknesses in installed systems; and monitor, on a continuing basis, the functioning of the systems. However, according to a DOE official, this measurement system was not adopted because it was too complex and time-intensive to implement.

DOE is currently collecting from individual sites information that would be useful in measuring the new systems' effectiveness. Project teams make visits to sites and observe systems that have been installed. At certain sites, DOE has contracts with the Russian sites to collect information on the functioning of equipment such as nuclear material portal monitors, which can indicate how often the system has been operating and whether any problems have caused it to malfunction or be turned off. In addition, before installing security systems, DOE and Russian site officials conduct vulnerability assessments, which assess the probability of the existing nuclear security systems at the sites to prevent nuclear material theft. DOE officials also conduct joint visits to the sites with Gosatomnadzor (GAN)—the Federal Nuclear Radiation Safety Authority—and MINATOM officials to observe informal functional testing of such systems as alarms, and sensors and to discuss the operations of the systems with site personnel.

DOE Is Providing Long-Term Assistance to Operate and Maintain the Security Systems

DOE is providing sites in Russia with assistance to operate and maintain the new security systems after they are installed. DOE also has projects under way with MINATOM and GAN to develop nuclear material security regulations and enforcement, establish nuclear material security training centers, and install security improvements for trains and trucks that transport nuclear material between and within sites. While DOE has made progress on these projects, DOE does not expect to complete them before 2020. The Department initially planned to assist each site for up to 3 years after the installation of the security systems, but it currently anticipates that some sites will require assistance for longer periods because of poor economic conditions, while other sites may require less assistance.

DOE Is Assisting Sites With the Operation and Maintenance of the New Security Systems

DOE is assisting Russian sites with the long-term operations and maintenance of new security systems after the complete systems are installed. DOE refers to this as *operational assistance*; it includes the following:

- Warranties, maintenance, and spare parts that provide the sites with the ability to repair and replace system elements.
- Training of site personnel on how to operate and maintain equipment.
- Writing of procedures that instruct site personnel on how to control access to nuclear material, track nuclear material inventories and transfers made among buildings, and otherwise operate the installed systems.

According to DOE officials, operational assistance is necessary because the Russian sites where DOE helped install nuclear security systems lack the financial resources, adequately trained staff, and the knowledge of procedures to operate and maintain the systems effectively. For example, many of the sites cannot afford the warranties, parts, or technical support necessary to ensure that the new systems are fully operational. At six of the nine sites we visited, Russian officials stated that without assistance, operating the systems would be difficult. Russian and DOE officials said that while sites would still attempt to operate the equipment if assistance were no longer available, the level of operation and maintenance would be reduced, leaving material more vulnerable to theft.

In addition to providing operational assistance for sites with completed security systems, DOE officials are modifying the design and installation of security systems at sites where work is ongoing to minimize the amount of operational assistance that these sites will require once their systems are complete. For example, project teams are designing systems that use equipment produced in Russia rather than foreign-made equipment because Russian equipment may be easier for the sites to service and replacement parts may be more readily available. In addition, when designing security systems, project teams are considering how the sites will be able to integrate the systems into the sites' activities, for example, by considering how many people enter and exit the sites each day when deciding where to place nuclear material portal monitors.

DOE Is Assisting Russian Agencies That Regulate and Enforce Nuclear Security

In addition to operational assistance to sites, DOE is assisting Russia with developing regulations and enforcement activities for nuclear material security, developing a national inventory of nuclear material, training personnel on nuclear material security, and improving the security of nuclear material while in transit. The two primary recipients of this assistance, which DOE refers to as *national infrastructure assistance*, are MINATOM and GAN. DOE is assisting both organizations with writing regulations and developing inspection systems for sites under their control. Currently, about half the necessary nuclear material security regulations have been developed, and DOE anticipates it will be several more years before all the necessary regulations are in place and adopted. Additionally, DOE is supporting GAN's inspection and enforcement role by training GAN inspectors on how to carry out their responsibilities, providing equipment that the inspectors use to take measurements of the nuclear material when they go to sites, and conducting joint site visits with DOE project teams to ensure that the inspectors understand their roles and responsibilities.

DOE is providing MINATOM with assistance to develop a national nuclear material inventory, which is required under Russia's new regulations. This requirement is an important element in strengthening nuclear material security in Russia. By requiring sites to make inventory information available to a national database on a periodic basis, the Russian government can improve its ability to track the location, type, and quantity of material at its nuclear facilities and detect possible thefts. Currently, 20 percent of the sites with weapons-usable nuclear material in Russia are reporting inventory information to the national database, and DOE officials expect that it will be at least 3 more years before all sites are reporting some level of data.

In addition to regulatory and enforcement activities, DOE is also supporting the development of nuclear material training centers in Russia. For example, DOE is supporting two centers that train personnel on how to operate and maintain the systems. The Russian Methodological Training Center specializes in material control and accounting training, and the Interdepartmental Special Training Center specializes in physical protection training. DOE is also supporting a 2-year graduate program in nuclear material security at the Moscow Engineering Physics Institute for site managers and nuclear security officials.

DOE is also providing physical protection systems for the trucks and rail cars used in transporting nuclear material. The trucks and rail cars can handle large bulletproof containers equipped with security locks used to carry nuclear material while in transit. The containers are difficult to steal because they are heavy and require cranes for loading on and off the trucks and rail cars. DOE is also supporting other national efforts, such as the provision of materials to be used at sites to calibrate equipment.

Need for Operational Assistance Will Vary Among Sites in Russia

DOE plans to assist every site to ensure the long-term operation of nuclear security systems after their installation. DOE has limited information on how much assistance each site requires because it has not conducted a programwide assessment of the cost of operating and maintaining the systems and the sites' ability to cover these costs. Furthermore, DOE only recently began providing completed sites with operational assistance and has limited experience in gauging how much assistance these sites or others will need and for how long.

DOE officials initially estimated that sites would require operational assistance for up to 3 years after the new security systems' installation. However, on the basis of the experience at the sites where the installation of security systems is complete, DOE officials now anticipate that some sites will require assistance for longer periods of time. This shift to support the systems for a longer period than originally anticipated is due to several factors, including (1) the poor economic conditions at some sites, (2) the sites' need for technical assistance to operate some of the installed equipment, and (3) the low priority that some sites attach to nuclear material security.

To determine the amount and type of assistance that is needed, DOE officials are surveying six of the completed civilian sites with regard to their need for spare parts, warranties, procedures, training, and operational funding. On the basis of the results of the survey and discussions with the sites, DOE will determine what type of assistance the sites need to ensure that the systems are properly operated. However, DOE officials have not surveyed other sites to determine what their current security system costs are and whether they have the financial and technical resources to maintain the newly improved systems. Some of these sites where DOE is still installing systems are larger and in better financial condition than the six sites in the study. Because larger sites may have more resources and greater potential to generate revenue, the level of assistance will differ from that required at smaller sites with more limited resources and income potential.

DOE Faces Challenges in Meeting Program Cost Estimates and Time Frames

DOE estimates that it will complete the Material Protection, Control, and Accounting program in 2020 at a total cost of about $2.2 billion. However, DOE officials said that the cost estimate and time frame are uncertain because DOE faces challenges in implementing the program. For example, DOE's initiative to consolidate the number of buildings and sites that contain nuclear material could reduce the cost of completing the program, but the initiative is encountering obstacles because MINATOM has not identified which buildings and sites it plans to close.

DOE Estimates That It Will Spend $2.2 Billion Through 2020 to Complete the Program

DOE estimated in 1995 that it would spend $400 million through fiscal year 2002 to finish installing the nuclear material security systems. Since 1995, the scope of the Material Protection, Control, and Accounting program has expanded. In response to our March 2000 recommendation to develop a new cost estimate and time frame for completing all the elements of the expanded program, the Department now estimates that it will complete the installation of security systems in 2011 and continue to provide assistance through 2020 at a total cost of $2.2 billion.

The 1995 estimate included the cost to install upgrades at buildings in Russia and other newly independent states of the former Soviet Union.[8] The current estimate includes the following:

- $823.1 million to complete the installation of nuclear material security systems in 288 buildings in Russia by fiscal year 2011.[9] This includes $74.9 million to complete Navy sites by fiscal year 2004, $212.7 million to complete civilian sites by fiscal 2008, and $535.5 million to complete the nuclear weapons laboratories by fiscal 2011.
- $711.8 million to support the long-term operation and maintenance of the systems through fiscal year 2020, including operational assistance to sites as well as assistance to the federal agencies that regulate and enforce nuclear material security.
- $387.2 million through fiscal year 2010 on an initiative to reduce the number of buildings and sites that contain nuclear material by consolidating Russia's nuclear material into fewer buildings and converting some of the material into a form that cannot be used for weapons.
- $241.3 million through fiscal year 2020 for program management, which includes the cost of the program's financial management system, compliance with export controls, contract management, travel coordination, administrative and secretarial support, and the Technical Survey Team.

The difference between the 1995 estimate and the current estimate is based on changes in DOE's assumptions about the scope of the nuclear material security problem in Russia, in particular, a threefold increase in the number of buildings in Russia where DOE is installing security systems. In addition, DOE officials' initial assumption that Russia would reach a level of economic stability by 2000 to support the long-term

[8] The other newly independent states where DOE installed nuclear security systems include Belarus, Georgia, Kazakstan, Latvia, Lithuania, Ukraine, and Uzbekistan. In 1999, DOE completed the installation of the systems in these countries and transferred funding for sustaining the systems to DOE's Office of International Safeguards. The $2.2 billion estimate covers the costs of the program in Russia only. In addition, the $2.2 billion does not include the $474.8 million estimated cost for security systems at 42 Russian Navy nuclear weapons storage sites, discussed in appendix I, or $228.9 million for International Emergency Cooperation—a program, funded together with nuclear material security assistance to Russia, that assists other countries in cases of nuclear accidents or smuggling incidents.

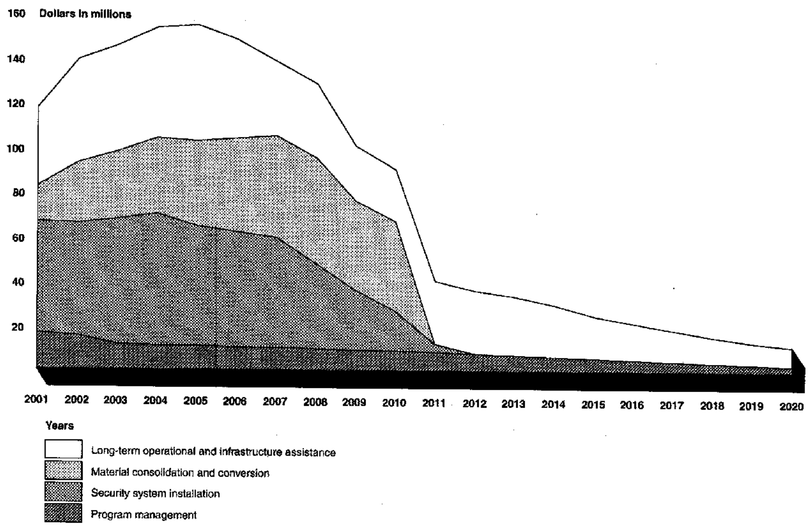
[9] Since DOE issued the cost and time frame estimate in July 2000, it has reduced the number of buildings needing security systems by 36.

operation and maintenance of the security systems did not materialize. DOE officials found that the economic decline culminating in the August 1998 collapse of the Russian economy adversely affected the ability of Russian sites to commit the necessary resources to fully sustain the security systems. Similarly, DOE officials found that Russia needs assistance beyond installing security systems, such as assistance with developing nuclear security regulations and enforcement capabilities. Consequently, DOE officials now assume that Russia will achieve the economic and political stability to operate and maintain the nuclear material security systems by 2015 and that DOE will gradually phase out assistance from 2015 through 2020. Finally, the limited access to sensitive buildings that MINATOM has given to DOE's project teams has caused delays in the plan to complete the installation of security systems by fiscal year 2002.

In developing the time frames for completing the program by 2020, DOE officials took into account several factors that limit how quickly it would be able to install security systems. In particular, DOE's time frame estimates take into account Russia's short construction season due to weather conditions, the sites' ability to provide the personnel to install the systems, and the time needed to negotiate access to sensitive sites. DOE officials also assumed that the portion of the Department's budget devoted to improving security at the 40 nuclear sites would increase from about $118 million in the fiscal year 2001 budget to $155 million in the fiscal 2005 budget.[10] According to a DOE official, if the program's funding were to remain at current levels, it will take at least 4 additional years to install security systems at Russian sites (from 2011 to 2015). Figure 4 shows DOE's yearly spending estimates for fiscal years 2001 through 2020.

[10] Information on DOE's expenditures through fiscal year 2000 can be found in appendix IV.

Figure 4: DOE's Cost Estimate to Complete the Material Protection, Control, and Accounting Program, Fiscal Years 2001-20



DOE's Cost Estimate and Time Frame Are Uncertain

DOE officials expressed uncertainty about the cost estimate and time frame for completing the program because of a number of issues, including the lack of access to sensitive sites and DOE's limited experience in some types of assistance that it is providing.

DOE officials said that the greatest uncertainty in the cost estimate and time frame for completing the installation of security systems stems from the lack of access to sensitive sites, in particular, the nuclear weapons laboratories. In contrast, DOE officials have the most confidence in the cost estimates for sites where its project teams have good access for designing and installing the systems, such as most civilian and Russian Navy sites. The lack of access creates uncertainty because project teams do not know how many buildings at the nuclear weapons laboratories require security systems or when they will be able to start and complete the installation of security systems. The number of buildings is a major factor in the cost of improving security at a site because each building requires that the project team design and install a unique security system. Some of the nuclear weapons laboratories may have more buildings than DOE officials have assumed, and others may have fewer.

DOE officials are also uncertain of the cost estimate for installing security systems because project teams have less experience in installing and developing cost estimates for security systems at the large and complex buildings in the nuclear weapons laboratories that enrich uranium or reprocess plutonium for use in weapons. Although DOE has installed security systems for buildings where Russian civilian sites work with nuclear material, the buildings where the weapons laboratories work with nuclear material are much larger. Therefore, DOE cannot assume that the cost of installing security systems at buildings in the weapons laboratories is about the same as it is at civilian sites.

Another source of uncertainty in the program's cost estimate for completing the program stems from DOE's limited experience in providing operational assistance to sites and assistance to Russia's regulatory and enforcement agencies. On the basis of its limited experience in providing a handful of small completed civilian sites with operational assistance, DOE officials used generic assumptions about how much assistance it would provide at each site after installing nuclear security systems rather than developing individual estimates for each of the sites. At most sites, DOE officials anticipate that the Department will provide operational assistance, at gradually declining levels, through 2020. Similarly, DOE officials regard their assistance to Russia's nuclear regulatory and enforcement agencies as a long-term effort to continue through 2020, but DOE has not yet completely determined what the assistance will consist of beyond its plans for the next few years.

DOE plans to update its cost estimate and time frame for completing the program annually. DOE officials said that they would develop more confidence in their estimates as they gain more experience in the areas where there is currently more uncertainty. For example, DOE officials expect to complete the installation of security systems at two sensitive uranium-processing sites where project teams have physical access in fiscal year 2001. After completing these two sites, DOE will have a better basis to estimate the costs of installing systems at large processing buildings in the nuclear weapons laboratories. Similarly, DOE is just beginning to implement a pilot project to negotiate alternatives to physical access at sensitive buildings at two nuclear weapons laboratories. The outcome of the pilot project will help DOE officials make better assumptions about the process of gaining access to buildings in the rest of the nuclear weapons laboratories.

DOE is in the process of developing for the program a strategic plan that ties together the program's goals, priorities, and strategies for reducing the risk of theft in Russia with the program's costs and time frames for completing the program. Such a plan could provide DOE managers with guidance as they adjust the implementation of the program to take into account changes in time frames for installing systems and the amount of access DOE project teams may have to buildings. According to a DOE official, the plan, when completed in April 2001, will tie together the cost estimate and time frame for completing the program with a revised version of the Guidelines for Material Protection, Control, and Accounting Upgrades at Russian Facilities which, among other things, sets out the program's goals, priorities, and strategies for installing security systems that reduce the risk of theft at Russian sites.

Material Consolidation and Conversion, if Successful, Could Reduce Program Costs and the Number of Buildings That Contain Nuclear Material

Under the Material Consolidation and Conversion initiative, one of DOE's strategies for completing the program is to reduce the number of buildings and sites that contain nuclear material and need security systems. DOE's cost estimate and time frame for completing the program sets a goal of closing 50 buildings and five sites by 2010. Under the initiative, the reduction would take place by consolidating nuclear material into fewer buildings and sites and converting 24 metric tons of highly enriched uranium, or about 3 percent of the estimated 603 metric tons of weapons-usable nuclear material in Russia, into low enriched uranium that cannot be used for weapons.[11] DOE estimates that the Material Consolidation and Conversion initiative will cost $387.2 million through fiscal year 2010.

If DOE is successful in implementing the initiative, the overall cost of the program could decrease because fewer buildings and sites would need nuclear material security systems. The potential cost savings of the initiative depends in large part on the complete removal of material from buildings or sites. In such cases, DOE would avoid the cost of installing

[11]According to DOE, about three-quarters of the material to be converted will be uranium enriched to 85 percent in the isotope U-235. DOE officials told us that by converting this material, risk will be reduced for material that is some of the most attractive to theft in Russia.

security systems or, if the systems are already installed, providing assistance for their operation and maintenance. In addition, the initiative would completely eliminate the risk of theft at the buildings and sites that no longer contain nuclear material. However, the initiative has had limited success since its inception in 1999. In particular, the Material Consolidation and Conversion initiative has not resulted in the complete removal of weapons-usable nuclear material from any buildings or sites.[12] Furthermore, DOE faces a number of obstacles to implementing the initiative, in particular, MINATOM's reluctance to identify which sites and buildings will close.

DOE is working with MINATOM to develop a plan for the Material Consolidation and Conversion initiative that identifies which buildings and sites will no longer contain nuclear material. In May 2000, MINATOM presented DOE with a draft of the plan that envisioned closing 60 buildings and converting about 27 metric tons of material, but the draft did not identify which buildings would close. According to DOE officials, MINATOM wants a separate arrangement on the initiative before it provides DOE with information on what buildings and sites will close, but the United States has temporarily suspended negotiations on such an arrangement because of U.S. policy concerns about Russia's nuclear cooperation with Iran. In the meantime, without information on which buildings and sites will close, DOE risks installing nuclear security systems at buildings or sites that will contain nuclear material for only a short period of time. If this happens, DOE would spend funds to install security systems at buildings that will not ultimately need them.

Another obstacle to the Material Consolidation and Conversion initiative is the reluctance of sites in Russia to give up their nuclear material. The sites are reluctant because they may have an ongoing need for the material and because personnel at the sites may lose special status and benefits that come with working with nuclear material such as extra vacation, early retirement, and higher pay. For example, DOE and MINATOM agreed in 1999 to the goal of removing all the nuclear material from two buildings at the Lytkarino Research Institute of Scientific Instruments by the end of 2000 by converting the site's highly enriched uranium to low enriched

[12]The program has had more success at removing materials from buildings at sites that are not in the initiative. DOE has helped Russian facilities consolidate materials into fewer buildings at the State Research Institute, Scientific Industrial Association; the Institute of Physics and Power Engineering; Dmitrovgrad; Novosibirsk; and several of the Russian Navy's nuclear fuel storage sites.

uranium. However, both of the buildings still contained nuclear material when we visited the site in October 2000, and site officials told us that they do not plan to provide material for conversion under the initiative for the next 2 to 3 years. We also met with officials at the State Research Institute, Scientific Industrial Association (also known as Luch)—one of the two sites that is converting highly enriched uranium to low enriched uranium. These officials told us that they are encountering difficulties in obtaining highly enriched uranium for conversion because Russian sites believe they will receive more money and support from DOE by retaining their weapons-usable nuclear material.

As of December 2000, the initiative resulted in the conversion of about 1.6 metric tons of highly enriched uranium. DOE officials have also successfully negotiated verification measures with both of the sites that are converting the material to provide assurances that the sites actually convert highly enriched uranium to low enriched uranium that cannot be used for weapons. However, DOE's initiative has not yet resulted in the closure of any buildings or sites; therefore, DOE officials are not sure of the extent to which the initiative will result in an overall cost savings to the program. Furthermore, while material conversion is reducing the proliferation risk for the material converted to low enriched uranium, it is not reducing the risk of theft at the buildings and sites that are contributing the highly enriched uranium because those buildings and sites still contain weapons-usable nuclear material and still require nuclear security systems. Given the lack of progress in closing buildings and sites, DOE officials said that they are reevaluating whether to continue with material conversion. DOE officials said that the initiative's primary goal is to reduce the risk of nuclear material theft and that they favor continuing the material conversion even if it does not result in the closure of any buildings or sites because the risk of theft for the material that is converted would still be eliminated.

Conclusion

DOE is improving the security of 192 metric tons of weapons-usable nuclear material in Russia by installing modern security systems that detect, delay, and respond to attempts to steal nuclear material. These systems, while not as stringent as those installed in the United States, are designed to reduce the risk of nuclear material theft at Russian sites. While Russia and the United States have worked cooperatively to reduce the risk of theft in Russia, Russian officials' concerns about divulging national security information continue to impede DOE's efforts to install systems for several hundred metric tons of nuclear material at sensitive Russian sites. Continued progress in reducing the risk of nuclear material theft in

Russia hinges on DOE's ability to gain access to Russia's sensitive sites and reach agreement with MINATOM to reduce the number of sites and buildings where nuclear material is located. Achieving these two goals would improve security for large amounts of nuclear material and reduce program costs. Regarding the systems that are already installed, DOE currently does not have a means to periodically monitor the systems to ensure that they are operating properly on a continuing basis. Such a mechanism would provide DOE officials with increased confidence that the security systems are reducing the risk of nuclear material theft.

The fact that DOE is developing a strategic plan that ties together the program's goals, priorities, and strategies for reducing the risk of theft in Russia with the cost and time frames estimate is a positive step forward. Such a plan will provide DOE managers with guidance as they adjust the implementation of the program to take into account the changes in the time frames for installing systems and the amount of access that DOE project teams may have to buildings. We believe that the plan developed by DOE should provide an estimate of how much sustainability assistance is required on the basis of an analysis of the costs to operate and maintain the systems and the sites' ability to cover these costs. In addition, the plan should provide options for completing the program on the basis of the progress made on gaining access to sensitive sites and the closure of buildings and sites.

Recommendations for Executive Action

In order to assist DOE in its mission of promoting nuclear nonproliferation and reducing the danger from weapons of mass destruction, we recommend that the Administrator of the National Nuclear Security Administration

- develop a system, in cooperation with the Russian government, to monitor, on a long-term basis, the security systems installed at the Russian sites to ensure that they continue to detect, delay, and respond to attempts to steal nuclear material and
- include in the strategic plan being developed by DOE (1) an estimate of how much sustainability assistance is required on the basis of an analysis of the costs to operate and maintain the systems and the sites' ability to cover these costs and (2) options for completing the program on the basis of the progress made in gaining access to sensitive sites and on the closure of buildings and sites.

Agency Comments and Our Evaluation

In commenting on a draft of our report, DOE generally agreed with our findings and concurred with our recommendations.

In its comments, DOE stated that in addition to the amount of nuclear material that received the completed and partially completed security systems cited in the report, the program has work under way on an additional 130 metric tons of nuclear material. We incorporated this fact into the report where appropriate. DOE also stated that it has work under way to improve security at 42 nuclear weapon sites that contain about 260 metric tons of material. As discussed in our report, the scope of our work includes DOE's assistance to improve the security of weapons-usable material controlled by Russia's civilian authorities, nuclear weapons laboratories, and the naval nuclear fuel storage facilities. Appendix I discusses the status of DOE's nuclear weapons security work, and we have added the fact that the 42 sites contain about 260 metric tons of nuclear material into appendix I where appropriate.

DOE also noted in its comments that it has recently reached a draft agreement with MINATOM to provide DOE personnel with greater access to sensitive MINATOM sites. This agreement is undergoing interagency review with the executive branch. According to the Department, while some of the more sensitive areas at MINATOM's nuclear sites may remain inaccessible to program personnel, this agreement will allow the program to expand its work once it is concluded. We incorporated this information into the report where appropriate.

Scope and Methodology

The scope of our review includes DOE's assistance to improve the security of weapons-usable nuclear material controlled by Russia's civilian authorities, nuclear weapons laboratories, and Navy nuclear fuel storage facilities. We reviewed DOE's program to (1) install nuclear security systems at sites; (2) assist sites with the long-term operation of the installed systems; (3) support the development of regulations and the enforcement of nuclear material security, nuclear material security training centers, and security improvements to trains and trucks used to transport nuclear material between and within sites; and (4) reduce the number of buildings and sites that contain nuclear material through consolidation and conversion.

To meet our objectives, we analyzed DOE's program documents, including the Technical Survey Team's assessments of the status of nuclear security efforts at sites and their compliance with DOE's guidance. At the nine sites we visited in Russia, we observed nuclear security systems and spoke with Russian officials responsible for working with DOE project teams to install and operate the systems. We also met with MINATOM and GAN officials to discuss the overall status of cooperation to improve nuclear material security in Russia. In addition, we met with DOE project teams to discuss their efforts to improve nuclear material security. We analyzed information from DOE on the number of buildings where the installation of nuclear material security systems is complete, the number where systems are currently being installed, and the number of buildings where work has yet to be initiated. We met with DOE officials in charge of managing the program to discuss DOE's policy on access to sensitive Russian sites and how DOE measures the effectiveness of the nuclear security systems.

We analyzed DOE's assistance to sites to support the operation of the nuclear material security systems and assistance to the federal agencies that regulate and enforce nuclear security by reviewing program documents, meeting with DOE officials, and discussing the need for long-term support with Russian officials. We analyzed DOE's cost estimate and time frame for completing the program, including the estimate for completing the installation of nuclear security systems and helping sites operate the systems after their installation. We met with DOE officials to discuss the methodology for developing the cost estimate and time frame and their assumptions about key factors influencing the estimate. We reviewed the status of the Material Consolidation and Conversion initiative by analyzing DOE documents; meeting with DOE officials responsible for the initiative; and discussing the initiative with MINATOM, GAN, and Russian site officials. We obtained the program's budget, obligation, and expenditure data through fiscal year 2000 from DOE. We did not independently verify the quality or accuracy of the financial data that program managers and laboratory personnel provided us with, but we compared the data with DOE's Program Management Information System and found that it matched the data that DOE provided us with.

We interviewed officials from DOE's Office of International Materials Protection and Emergency Cooperation and from the national laboratories, including Brookhaven, Lawrence Livermore, Los Alamos, Oak Ridge, Pacific Northwest, and Sandia. We conducted our review from April 2000 through February 2001 in accordance with generally accepted government auditing standards.

As agreed with your office, unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days after the date of this letter. At that time, we will send copies of this report to the Honorable Spencer Abraham, Secretary of Energy; the Honorable Colin L. Powell, Secretary of State; the Honorable Donald H. Rumsfeld, Secretary of Defense; the Honorable Mitchell E. Daniels, Director, Office of Management and Budget; and interested congressional committees. We will make copies available to others on request.

If you have any questions concerning this report, we can be reached at (202) 512-3841 and (202) 512-4128, respectively. Major contributors to this report include Gene Aloise, F. James Shafer, Charles Bolton, Joseph Cook, and Julie Hirshen.

Gary L Jones

(Ms.) Gary Jones
Director, Natural Resources
and Environment

Harold J Johnson

Harold J. Johnson
Director, International Affairs
and Trade

Appendix I: DOE's Program to Install Security Systems at Russian Navy Nuclear Weapons Sites

In 1999, at the request of the Russian Navy, the Department of Energy (DOE) began installing security systems to protect the Russian Navy's nuclear weapons. This work is being done under the Department's Material Protection, Control, and Accounting program. U.S. officials are concerned about the security of nuclear weapons in Russia. Although there have been no known incidences, concerns exist that a Russian nuclear warhead could be lost or stolen. Under the program, DOE is installing security components, such as fences, strengthened vault doors, sensors for the fences and doors, access control systems, strengthened guard towers, video surveillance equipment, and radio communication equipment for the response forces for 42 Russian naval sites where nuclear weapons are stored. According to DOE, the 42 sites contain about 260 metric tons of nuclear material. DOE officials estimate that this work will cost about $474.8 million—$336.8 million for the installation of security systems at the 42 sites by the end of fiscal year 2004, and $138.0 million for long-term operational assistance for the 42 sites through fiscal 2020.

As of January 2001, DOE has begun installing the systems at 41 of the 42 sites. DOE installs the systems in two phases. During the first phase, DOE (1) installs security components that are intended to quickly improve the sites' ability to protect their weapons, such as fences, vehicle barriers, strengthened doors, and mechanical locks, (2) bricks up windows at storage buildings, and (3) strengthens the guard towers on site. In phase two, DOE installs additional components, such as communication systems, interior and exterior detection and assessment systems, and access-delay systems which provide greater protection for the weapons. As of January 2001, DOE had completed the first phase of security improvements at 19 sites and the second phase improvements at 1 site.

The Russian Navy has provided the project teams with limited access to the sites. According to a DOE official, project team members have been granted physical access to seven sites. For the other sites where DOE has done work, the Russian Navy has allowed team members to view the sites from a distance, for example, allowing them to drive by it, park at the site to view it, or walk up to the site's perimeter. DOE obtains confirmation that the equipment has been installed and is being used as intended through photographs of the site after the work is complete, during site visits by project team personnel, and through written certification by the Russian Navy.

The cost of the first phase of security improvements is approximately $475,000 for each site, while the cost for the more comprehensive improvements is estimated to be about $8 million per site. In its cost estimate for the Russian Navy's nuclear weapons sites, DOE officials also anticipate that each site will require about $300,000 per year in long-term operational assistance after the systems are installed, with the amount required diminishing over time. DOE, however, does not know how many years of long-term operational assistance will be required. While DOE estimates that it will complete the installation of security systems at the 42 known sites by the end of 2004, the Russian Navy has indicated that it would also like improved security systems installed at other locations, which could expand the program further. As of January 2001, however, the Navy had not specifically identified additional sites.

Appendix II: Status of Installed Security Systems in Russia

Table 3: Installed Nuclear Security Systems in Russia, Sitewide

Site	Number of buildings	Date completed
Joint Institute of Nuclear Research, Dubna	2	Feb. 1998
Moscow Scientific Research and Design Institute of Power Technology	2	Feb. 1998
Moscow Institute of Theoretical and Experimental Physics	3	Feb. 1998
Karpov Institute of Physical Chemistry	3	Feb. 1998
Beloyarsk Nuclear Power Plant	3	May 1998
Sverdlovsk Branch of Scientific and Design Institute of Power Technology	5	May 1998
Khlopin Radium Institute	4	May 1998
Petersburg Nuclear Physics Institute	4	May 1998
Moscow Engineering Physics Institute	4	June 1998
Tomsk Polytechnical University	3	July 1998
Krylov Shipbuilding Institute	3	Nov. 1998
Navy Site 49	4	Sept. 1999
Navy Site 34	2	Sept. 2000
Navy Refueling Ship PM-12	2	Sept. 2000
Navy Refueling Ship PM-63	2	Sept. 1999
Navy Refueling Ship PM-74	2	Aug. 2000
Ice Breaker Fleet, Imandra	2	Sept. 1999

Source: DOE.

Table 4: Installed Systems at Individual Buildings at Sites

Site	Program sector	Total number of buildings on site	Number of buildings with completed or partially completed systems installed
Institute of Physics and Power Engineering, Obninsk	Civilian research	12	8
Lytkarino	Civilian research	3	2
Novosibirsk	Civilian research	3	2
Elektrostal	Civilian research	11	2
Bochvar	Civilian research	8	0
Dmitrovgrad	Civilian research	10	5
Luch	Civilian research	6	4
Kurchatov Institute	Naval fuel	13	6
Sergiev Posad	Naval fuel	3	1
Site 32	Naval fuel	2	2
Site 86	Naval fuel	2	1
Sarov (Arzamas-16)	Nuclear weapons	40	5
Snezhinsk (Chelyabinsk-70)	Nuclear weapons	21	7
Ozersk (Mayak)	Nuclear weapons	18	1
Seversk (Tomsk-7)	Nuclear weapons	20	9
Zhelenznogorsk (Krasnoyarsk-26)	Nuclear weapons	6	3
Zelenogorsk (Krasnoyarsk-45)	Nuclear weapons	5	2
Novouralsk (Sverdlovsk-44)	Nuclear weapons	5	5
Avangard	Nuclear weapons	3	0
Zarechnyy (Penza-19)	Nuclear weapons	3	0
Trekhgorny (Zlatoust-36)	Nuclear weapons	3	0
Lesnoy (Sverdlovsk-45)	Nuclear weapons	3	0

Source: DOE.

Appendix III: Profile of Nuclear Sites in Russia Visited by GAO

Northern Fleet Storage Facility (Site 49)

Northern Fleet Storage Facility (Site 49) is located within the Russian Federation Naval Base at Severomorsk, about 9 miles northeast of Murmansk on the Kola Peninsula. Site 49 is the primary land-based storage facility for reactor fuel assemblies used by the Russian Northern Fleet naval vessels and holds tens of metric tons of weapons-usable nuclear materials. DOE helped install nuclear security systems and provided assistance to expand the storage bunker for the reactor fuel assemblies, which allowed the Northern Fleet to consolidate all of its fresh nuclear fuel at the site. DOE began work to improve the nuclear security at Site 49 in May 1996 and completed the installation of security systems in September 1999.

Krylov Shipbuilding Research Institute

The Krylov Shipbuilding Institute is located in St. Petersburg and employs over 3,000 scientists and support staff. The Institute's nuclear facility has a research reactor and three critical assemblies containing hundreds of kilograms of weapons-usable nuclear material. DOE began installing physical protection and material control and accounting systems at the site in April 1997 and completed the work in November 1998.

The Kurchatov Institute

The Kurchatov Institute is located in Moscow, about 10 miles from the Kremlin. Founded in 1943 as the Soviet Union's first nuclear weapons research site, the Institute is an independent laboratory under the direct authority of the Russian government. The Institute's research activities include the design and development of nuclear reactors for the Russian Navy, for the Russian icebreaker fleet, and for space applications. The Institute operates 6 research reactors and 14 critical assemblies, and has three storage facilities containing several metric tons of nuclear material. DOE began installing security systems at the Institute in August 1994.

Petersburg Nuclear Physics Institute

The Petersburg Nuclear Physics Institute is located in the town of Gatchina, about 30 miles south of St. Petersburg. The Institute is operated by the Russian Academy of Sciences and has one operating nuclear research reactor, one reactor under construction, one critical assembly, and a vault to store reactor fuel with hundreds of kilograms of nuclear material. DOE installed the new security systems at the site from February 1996 to May 1998.

Institute of Physics and Power Engineering

The Institute of Physics and Power Engineering is operated by Russia's Ministry of Atomic Energy and is located in the city of Obninsk, about 66 miles southwest of Moscow. The Institute is involved in the research and development of nuclear power reactors and employs about 5,000 people. The Institute possesses several metric tons of weapons-usable nuclear material. DOE began installing security systems at the Institute in September 1994 and is installing nuclear security systems in 11 buildings as well as in the central alarm station. DOE's project team also worked with the site to reduce the number of buildings that contain weapons-usable nuclear material from 22 to 7.

A.A. Bochvar All-Russian Scientific Research Institute of Inorganic Materials

The A.A. Bochvar All-Russian Scientific Research Institute of Inorganic Materials is located in northwest Moscow and is adjacent to the Kurchatov Institute. The Bochvar Institute was established in 1945 and conducted research for the Soviet Union's nuclear weapons program. The Institute, operated by Russia's Ministry of Atomic Energy, currently conducts research on nuclear fuel, including mixed-oxide fuel in support of Russia's plutonium disposition program, and employs about 1,300 people. Bochvar has several hundred kilograms of weapons-usable nuclear material on site. DOE began work at Bochvar in December 1997 but was limited by the site to installing material control and accounting systems until 1999, when the site agreed that DOE could begin installing physical protection systems.

State Research Institute, Scientific Industrial Association

The State Research Institute, Scientific Industrial Association (also known as Luch) is located about 22 miles south of Moscow. Luch is operated by Russia's Ministry of Atomic Energy and is involved in developing space and mobile reactors, including the TOPAZ reactor used in Russian satellites. DOE started work at Luch in late 1995 and is installing nuclear security systems in five buildings containing nuclear material and in a central alarm station. Luch, which has several metric tons of weapons-usable nuclear material on site, has consolidated the number of buildings where the material is located from 28 to 4. DOE is also contracting with Luch to convert highly enriched uranium to low enriched uranium under the Material Protection Control and Accounting program's Material Consolidation and Conversion initiative.

Lytkarino Research Institute of Scientific Instruments

The Lytkarino Research Institute of Scientific Instruments is located about 31 miles southeast of Moscow and is operated by the Ministry of Atomic Energy. The Institute is the primary organization in Russia for radiation resistance testing of materials, electronics, and electronic systems. DOE has worked with the Institute since September 1997 to install nuclear security systems in three buildings, including two containing nuclear materials and one central alarm station. The Institute contains hundreds of kilograms of weapons-usable material and participates in the program's Material Consolidation and Conversion initiative.

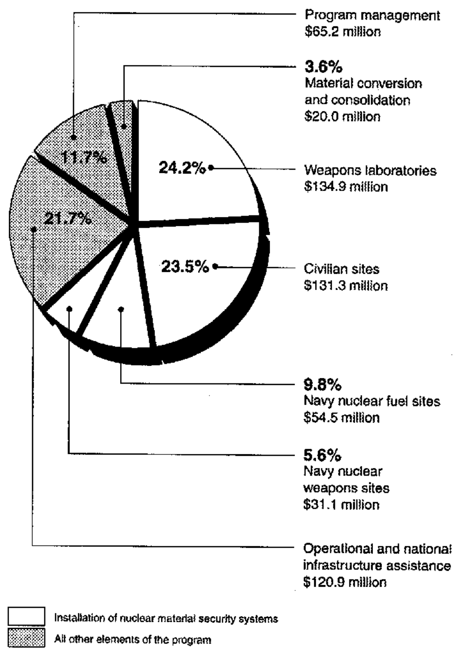
Moscow Engineering Physics Institute

The Moscow Engineering Physics Institute is a large university located in southeast Moscow. The Institute specializes in nuclear physics research and training and operates a research reactor using highly enriched uranium. The Institute has a small quantity of weapons-usable nuclear material on site. DOE worked with the Institute to install physical protection and material control and accounting systems in three buildings containing nuclear material and a central alarm station. DOE also supported the development of a graduate degree program in nuclear material security at the Institute. DOE began installing security systems at the site in February 1996 and completed the work in June 1998.

Appendix IV: DOE's Expenditures on Nuclear Material Security in Russia Through Fiscal Year 2000

From fiscal year 1993 through fiscal 2000, DOE spent $557.9 million on the Material Protection, Control, and Accounting program in Russia. As figure 5 shows, DOE spent $351.8 million, or 63 percent of the $557.9 million, on installing nuclear security systems at Russia's civilian sites, nuclear weapons laboratories, Navy nuclear fuel sites, and Navy nuclear weapons sites. DOE spent the remainder of the $557.9 million on operational and national infrastructure assistance, the Material Consolidation and Conversion initiative, and program management.

Figure 5: Breakdown of the $557.9 Million Spent on Nuclear Material Security, by Program Sector, Through Fiscal Year 2000



Note: The total does not equal 100 percent because of rounding.

Source: DOE.

For fiscal year 2000, DOE received an appropriation of $150 million for the program. The amount available for nuclear security assistance to Russia was reduced to $140.5 million by

- a general reduction of about $4.8 million to reduce the amount that DOE national laboratory personnel spend on travel and the number of national laboratory personnel on temporary assignment to the Washington, D.C., metropolitan area;
- a rescission of about $0.6 million as part of an omnibus appropriations act;
- a reprogramming of about $3 million to allow DOE to hire more federal managers for the program; and
- DOE's allocation of $1.2 million for International Emergency Cooperation, a related program that is included in the 20-year plan for completing the Material Protection, Control, and Accounting program but that is a separate program for assisting other countries in cases of nuclear accidents, nuclear smuggling, or terrorist incidents.

DOE also had a carryover of $85.5 million from fiscal year 1999, which brought the program's total fiscal year 2000 budget to $226 million. As of September 30, 2000, DOE had spent $138.7 million of its fiscal year 2000 budget, and it carried over $87.3 million into the program's fiscal 2001 budget. DOE's national laboratories obligated $59.4 million of the $87.3 million as of the end of fiscal year 2000. DOE had plans for the national laboratories to use the remaining $27.9 million to implement specific nuclear security projects, but the laboratories had not yet obligated these funds as of the end of the fiscal year.

Appendix V: Comments From the Department of Energy

Department of Energy
National Nuclear Security Administration
Washington, DC 20585

FEB 23 2001

Ms. Gary L. Jones
Director
Natural Resources and Environment
General Accounting Office
Washington, DC 20548

Dear Ms. Jones:

The National Nuclear Security Administration, and specifically, the Office of Defense Nuclear Nonproliferation has reviewed the General Accounting Office draft report, GAO-01-312, entitled "NUCLEAR NONPROLIFERATION: Security of Russia's Nuclear Material Improving; Further Enhancements Needed." This office and the Office of the Assistant Deputy Administrator for International Materials Protection and Emergency Cooperation appreciates the opportunity to have reviewed the draft report. Our comments are attached.

Sincerely,

Kenneth E. Baker
Kenneth E. Baker
Acting Deputy Administrator for
Defense Nuclear Nonproliferation

Attachment

cc: DOE Audit Liaison
NNSA Executive Staff Director

Printed with soy ink on recycled paper

Comments on
GAO Draft Report
"NUCLEAR NONPROLIFERATION:
Security of Russia's Nuclear Material Improving;
Further Enhancements Needed
(GAO-01-312)"

General Comments

DOE appreciates the opportunity to review the draft General Accounting Office (GAO) report, "Nuclear Nonproliferation: Security of Russia's Nuclear Material Improving; Further Enhancements Needed." As the GAO notes, a substantial amount—192 metric tons—of proliferation attractive material has received security upgrades through the Material Protection Control and Accounting Program (MPC&A). We agree with your judgement that this figure is direct threat reduction activity that serves US national security objectives. We also agree with GAO that critical work remains and DOE has work underway on an additional 130 metric tons of material. We would appreciate your reference to this fact. In addition, DOE has work well underway at—and considerable resources spent on--42 nuclear weapons sites housing about 260 metric tons of nuclear material. When the work representing these figures (130 plus 260 metric tons) is complete, the Program will have secured about 67% of the material in Russia believed to require security upgrades. Again, we think it appropriate to reference this information.

Allow me to share with you my thoughts on two additional topics raised in the report. As noted by the GAO, one of the largest obstacles to program implementation has been securing appropriate access to sensitive MinAtom facilities. I am pleased to report that last week the MPC&A program reached a draft agreement with MinAtom that represents a breakthrough on this contentious issue. Upon completion of interagency review, the program will sign an access agreement providing MPC&A personnel with greater access to more sensitive MinAtom facilities than any U.S. nonproliferation program. Some of the most sensitive parts of these facilities in the future may remain for security reasons largely inaccessible to program personnel, but resolution of the access problem will create major opportunities for further expansion of the program's work. Because the access issue has been of such high interest to senior officials throughout the executive and legislative branches, you may want to add in your final report a sentence containing the fact of the recent progress made on access.

I also wanted to comment briefly on the references throughout the report on the work of our Technical Survey Team. As noted in the report, the survey team provides the program's senior management with comprehensive, independent and technical analyses of all of the MPC&A projects. I am under the impression that the GAO examiners apparently found the survey team's work invaluable, as I believe it to be. To my knowledge few, if any, U.S. Government nonproliferation programs maintain and support teams like our Technical Survey Team. They are an important program management tool.

An audit of a program as complex as MPC&A is a time consuming process that at times can become controversial and even contentious. Such was not the case during this study. The GAO personnel who reviewed the MPC&A program were highly professional, dedicated and thoroughly competent. They solicited and listened to our input on the program but came to their own conclusions. Their approach to this work is of value to program management

<u>Recommendations</u>

We recommend that the Secretary of Energy

Recommendation 1.

Develop a system, in cooperation with the Russians, to monitor on a long term basis the security systems installed at the Russian sites to ensure that they continue to detect, delay, and respond to attempts to steal nuclear material.

Management Position

Concur

As discussed in the report, the U.S. and the Russians have begun joint visits to monitor the success of the systems installed and the maintainability of the systems. Additionally, the program is developing a programmatic architecture that will integrate all of the monitoring efforts.

Recommendation 2.

Include in the strategic plan under development by DOE (1) an estimate of how much sustainability assistance is required based on an analysis of the costs to operate and maintain the systems and sites' ability to cover these costs; and (2) options for completing the program based on progress made on gaining access to sensitive sites and the closure of buildings and sites.

Management Position

Concur

The program strategic plan has been in development since December 2000. We anticipate publication of the strategic plan during the month of April 2001. As GAO recommends, we have been the process of incorporating requirements for sustainability, costs estimates of operations and maintenance of systems, and the exit strategy. Additionally, as stated in the general comments, upon completion of interagency review, the program will sign an access agreement providing MPC&A personnel with greater access to sensitive MinAtom facilities. Some of the most sensitive parts of these facilities in the future may remain, for security reasons, largely inaccessible to program personnel, but resolution of the access problem will create major opportunities for further expansion of the program's work.

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United States General Accounting Office

GAO

Report to Congressional Requesters

May 2001

NUCLEAR NONPROLIFERATION

DOE's Efforts to Assist Weapons Scientists in Russia's Nuclear Cities Face Challenges

GAO
Accountability * Integrity * Reliability

GAO-01-429

Contents

Figures

Abbreviations

DOE	Department of Energy
EBRD	European Bank for Reconstruction and Development
ENCI	European Nuclear Cities Initiative
GAO	General Accounting Office
IPP	Initiatives for Proliferation Prevention
MINATOM	Russian Ministry of Atomic Energy
NCI	Nuclear Cities Initiative
VNIIEF	All-Russian Scientific Research Institute of Experimental Physics

GAO
Accountability * Integrity * Reliability
United States General Accounting Office
Washington, DC 20548

May 3, 2001

The Honorable John W. Warner
Chairman
Committee on Armed Services
United States Senate

The Honorable Pat Roberts
Chairman, Subcommittee on
Emerging Threats and Capabilities
Committee on Armed Services
United States Senate

In September 1998, the United States and Russia embarked on an ambitious nonproliferation program, known as the Nuclear Cities Initiative (NCI), to create sustainable job opportunities for weapons scientists in Russia's closed nuclear cities and to help Russia accelerate the downsizing of its nuclear weapons complex. Ten of these cities formed the core of the former Soviet Union's nuclear weapons complex. Many are located in geographically remote locations and were so secret that they did not appear on any publicly available maps until 1992. Behind their walls, thousands of scientists and engineers worked on the design, assembly, and production of the Soviet nuclear arsenal. These Russian cities remain high-security areas, and access to them is limited. Russia's Ministry of Atomic Energy (MINATOM) manages the nuclear facilities that are located within the cities. MINATOM estimates that about 760,000 people live in the nuclear cities, including the family members of the nuclear workers as well as teachers and various support personnel. Approximately 122,000 inhabitants are employed in key nuclear enterprises.

The Russian government has announced its intention to reduce the size of its nuclear weapons complex and asked for U.S. assistance in this endeavor. A critical component of this effort includes finding new employment opportunities for weapons scientists, engineers, technicians, and support staff who will lose their jobs from the complex's downsizing. The U.S. government has also been concerned that Russian weapons scientists in need of money may sell sensitive information to countries or terrorist groups trying to develop weapons of mass destruction. NCI, which is being implemented by the Department of Energy (DOE) and its national laboratories,[1] seeks to assist Russia in downsizing its weapons complex by employing weapons scientists and other residents of the cities in nonmilitary scientific or commercial activities. NCI works in conjunction with another DOE program—the Initiatives for Proliferation Prevention (IPP)—which also seeks to employ weapons scientists and is implemented throughout all of Russia, including several nuclear cities, as well as Ukraine, Belarus, and Kazakhstan.

In early 1999, we issued a report addressing both programs, identified a number of management weaknesses, and recommended several corrective actions.[2] Regarding NCI, we pointed out that the program faced impediments to success, including restrictions on access to the cities and poor prospects for foreign investment. We recommended that NCI not expand beyond three pilot cities in Russia—Sarov, Snezhinsk, and Zheleznogorsk—until DOE had demonstrated that its efforts were achieving the program's objectives of creating jobs for weapons scientists. Currently, the program is operating in these cities, plus Avangard—a nuclear weapons assembly/disassembly facility located in Sarov. This report discusses the (1) costs to implement NCI, including the amount of program funds spent in the United States and Russia, as well as planned expenditures; (2) impact of the Department's NCI projects; and (3) status of the European Nuclear Cities Initiative (ENCI).

To develop this information, we obtained cost data from DOE's headquarters and the national laboratories. We reviewed all of DOE's NCI projects to determine their impact on meeting the program's goals and objectives. We also met with MINATOM officials in Russia and visited the closed nuclear city of Sarov. In addition, we met with, among others, officials of Italy's Ministry of Foreign Affairs who are major proponents of the proposed ENCI.

[1]The Department manages the largest laboratory system of its kind in the world. The mission of DOE's 23 laboratories has evolved. Originally created to design and build atomic bombs, these laboratories have since expanded to conduct research in many disciplines—from high-energy physics to advanced computing.

[2]See *Nuclear Nonproliferation: Concerns With DOE's Efforts to Reduce the Risks Posed by Russia's Unemployed Weapons Scientists* (GAO/RCED-99-54, Feb. 19, 1999).

Results in Brief

From fiscal year 1999 through December 2000, the expenditures for the Nuclear Cities Initiative totaled about $15.9 million. Of that amount, about $11.2 million (or 70 percent) had been spent in the United States, and about $4.7 million (or 30 percent) had been spent for projects and activities in Russia. The U.S. national laboratories' costs to implement the program represented the bulk of the funds spent in the United States for such items as overhead, labor, equipment, and travel. Department of Energy officials told us that these expenditures, although significant, were part of startup costs for the program. These officials told us that laboratory costs will be reduced and that the laboratories' role will diminish as commercial investors develop business contacts in the nuclear cities as a result of the program. Officials from Russia's Ministry of Atomic Energy told us that they are dissatisfied with the amount of program funds that have been spent in Russia and that if the Department is serious about creating jobs for Russian weapons scientists, more funds must be spent in Russia. Expenditures for Russia included contracts with Russian organizations to buy computers and other equipment, a small business bank loan program, and various community development projects. In response to direction provided in a conference report on its fiscal year 2001 appropriations, the Department of Energy stated that its goal is to spend at least 51 percent of its program funds for fiscal year 2001 in Russia. Regarding planned expenditures, the Department has not developed (1) a plan that addresses future program costs and (2) a time frame with quantifiable performance measures to determine how effectively the program is meeting its goals and when and if the program should expand beyond the three nuclear cities. This report recommends that the Department develop a plan with clearly defined goals that serves as a basis for determining the program's future scope and direction and strengthen its efforts to reduce national laboratory costs in order to place more program funds in Russia.

During its first 2 years, the Nuclear Cities Initiative has funded 26 projects that have had limited success in meeting the program's principal objectives—creating jobs for weapons scientists and helping to downsize Russia's weapons complex. Many of the projects were not carefully reviewed for their commercial potential, as the Department wanted to implement the program quickly and engage the Russians. According to the Department, the projects are employing about 370 people, including many weapons scientists who are working primarily on a part-time basis through research projects sponsored by the U.S. national laboratories. However, according to Russian officials, most of the scientists receiving program funds continue to work on Russia's weapons of mass destruction program and are also receiving a salary paid for by the Russian government. One project has helped create commercial space in several buildings previously used for nuclear weapons assembly work in the city of Sarov. About one-half of the projects are not designed to create jobs for weapons scientists and instead focus on, among other things, such activities as the delivery of medical equipment and school exchange programs. While Department officials told us that these projects are needed to make the nuclear cities more attractive to business investment, Russian officials have criticized them because they do not create jobs for weapons scientists. Furthermore, none of the industry officials we spoke with said that they would more likely invest in the nuclear cities because of municipal and social improvements. The Department has two programs—the Nuclear Cities Initiative and the Initiatives for Proliferation Prevention—operating in Russia's nuclear cities that share a common underlying goal and, in some cases, the same types of projects. The operation of these two very similar programs in Russia's nuclear cities has caused duplication of effort. This report contains a recommendation that the Department evaluate all of the Nuclear Cities Initiative projects, particularly community development activities, and eliminate those that do not meet the program's basic objectives of creating jobs and assisting with the downsizing of Russia's nuclear weapons complex. The report also recommends that the Department determine whether the Nuclear Cities Initiative and the Initiatives for Proliferation Prevention should be consolidated into one effort in order to achieve potential cost savings and other efficiencies.

The European Nuclear Cities Initiative is a proposed program that is being supported by the Italian Ministry of Foreign Affairs. The European program is expected to be smaller in scope than the U.S. Nuclear Cities Initiative and to differ in some respects from the U.S. program. For example, the European Nuclear Cities Initiative is expected to (1) target older scientists, who are considered to pose a greater proliferation risk than younger Russian scientists; (2) initially be limited to two Russian nuclear cities; and (3) emphasize environmental and energy-efficiency projects. Furthermore, officials responsible for developing the European Nuclear Cities Initiative told us that their program will not focus on establishing sustainable commercial businesses in the cities. Instead, the European program plans to fund projects that utilize weapons scientists' skills to help develop environmental and energy-efficiency-related technologies that can be used by European companies. The funding for the European Nuclear Cities Initiative has not yet been determined, but Italian officials estimated that $50 million would be needed over the next 5 years to implement the program.

We presented a draft of this report to the Department for comment, and it concurred with our recommendations. The Department also provided technical clarifications, which we incorporated where appropriate.

Background

In July 1998, then Vice President Gore and the former Prime Minister of Russia issued a joint statement noting that nuclear disarmament is associated with several socioeconomic factors, including the problem of finding worthwhile civilian-sector employment for Russian personnel formerly employed in the nuclear weapons complex. In September 1998, both countries signed an agreement—the Nuclear Cities Initiative—to create jobs for people in the nuclear weapons complex. Russian officials have identified the need to create 30,000 to 50,000 jobs in its nuclear cities over the next several years. Under the terms of the agreement, the United States will seek to assist in creating new jobs by

- sharing its experience in downsizing the U.S. nuclear weapons production complex;
- facilitating the selection of promising commercial projects that will lead to employment opportunities for workers;
- developing entrepreneurial skills for displaced workers, including training in how to write business plans;
- facilitating the search for potential investors, market analysis, and marketing for products and services; and
- facilitating access to existing investment mechanisms, including investment funds.

NCI is limited to working in the municipal areas of each city. Beyond these areas are various secret nuclear institutes or technical areas. DOE's strategy is to encourage investment in commercial enterprises in the municipal areas of the cities thus shrinking, over time, the size of the restricted areas in accordance with the plans of the Russian government. DOE officials believe that if commercial efforts are successful, not only will those employed in weapons manufacturing remain in the city but so will their relatives and friends and there will be less reason for weapons scientists, technicians, and engineers to leave the area. Figure 1 shows the location of Russia's 10 nuclear cities, and appendix I provides additional information about each city.

Figure 1: Russia's Nuclear Cities

Note: The Avangard plant is not a separate nuclear city. It is a major weapons assembly/disassembly facility located in the city of Sarov.

Source: GAO's presentation of information from DOE and MINATOM.

The day-to-day management of NCI resides within DOE's Office of Defense Nuclear Nonproliferation, National Nuclear Security Administration. DOE and its national laboratories have long-standing relationships with MINATOM and several closed cities as well as experience in the downsizing of the U.S. weapons complex. The NCI program is managed by an office director with a headquarters staff of seven employees who provide technical, budget, and procurement support. DOE headquarters is responsible for, among other things, setting overall program policy, providing oversight and guidance for the national laboratories, and allocating program funds. DOE has tasked the national laboratories to play a major role in the program.

DOE, under the same general authority under which it operates the NCI program, also operates the Initiatives for Proliferation Prevention program.[3] IPP seeks to employ weapons scientists in several countries of the former Soviet Union, including Russia and some of its nuclear cities. According to DOE, IPP is designed to commercialize technologies that utilize the expertise of the scientists who work at the various nuclear weapons institutes. Although the IPP program focuses on employing nuclear weapons scientists, it also has a component that seeks to employ scientists in the former Soviet Union's chemical and biological weapons institutes. In our 1999 report, we recommended that the Secretary of Energy take steps to maximize the impact of IPP's funding and improve oversight of the program. Specifically, we recommended, among other things, that the Secretary (1) reexamine the role and costs of the national laboratories' involvement with a view toward maximizing the amount of program funds going to the former Soviet Union, and (2) eliminate those IPP projects that did not have commercial potential. DOE subsequently implemented our recommendations.

The U.S. government has supported other programs that have directed money to scientists working in the closed cities. For example, since 1994, the U.S. Departments of State and Defense have spent over $40 million on scientific research projects in which one or more of the weapons institutes in Sarov, Snezhinsk, or Zheleznogorsk have participated.[4] These projects are administered under the auspices of the State Department's International Science and Technology Center program. The Center was established by international agreement in November 1992 as a nonproliferation program to provide peaceful research opportunities for weapons scientists and engineers in countries of the former Soviet Union. The scientists working with the Center conduct research and development

[3] See 42 U.S.C. 5817(a), 42 U.S.C. 7112(10), and 42 U.S.C. 5813(9). DOE's fiscal year 2001 expenditures for both programs are authorized under separate provisions of the National Defense Authorization Act for Fiscal Year 2001 and are subject to different requirements and restrictions under this and other authorization acts.

[4] Other institutes throughout Russia and other countries of the former Soviet Union also participate in some of these projects.

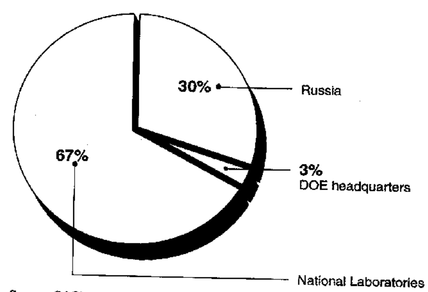
in a variety of scientific fields, such as environmental remediation and monitoring, nuclear reactor safety, vaccines and other medical treatment, and energy production.

The U.S. government has also undertaken efforts in the nuclear cities through the U.S. Civilian Research and Development Foundation. Established by the U.S. government in 1995, the Foundation is a nonprofit charitable organization designed to promote scientific and technical collaboration between the United States and the countries of the former Soviet Union. From October 1996 through December 2000, the Foundation awarded 19 grants totaling about $275,000 to support projects in Sarov and Snezhinsk. The Foundation receives funding from the Department of State, the National Science Foundation, the National Institutes of Health, the Department of Defense, and several private organizations.

NCI Program Expenditures

From fiscal year 1999 through December 2000, NCI's expenditures totaled about $15.9 million. Of that amount, about $11.2 million (or 70 percent) had been spent in the United States by the national laboratories and DOE's headquarters, and about $4.7 million (or 30 percent) had been spent for projects and activities in Russia as shown in figure 2. The U.S. national laboratories' costs to implement the program for such items as overhead, labor, equipment, and travel represented the bulk of the funds spent in the United States. DOE officials told us that these expenditures were significant but were part of the program's start up costs. These officials told us that laboratory costs will be reduced and that the laboratories' role will diminish as commercial investors develop business contacts in the nuclear cities as a result of the program. The expenditures for Russia included contracts with Russian organizations to buy computers and other equipment, a small business bank loan program, and various community development projects. MINATOM officials told us that they were dissatisfied with the amount of program funds that had been spent in their country. In response to direction provided in a conference report on its fiscal year 2001 appropriations, DOE stated in its program guidance that its goal is to spend at least 51 percent of fiscal year 2001 program funds in Russia.

Figure 2: Breakout of NCI Program Expenditures Totaling $15.9 Million as of December 2000

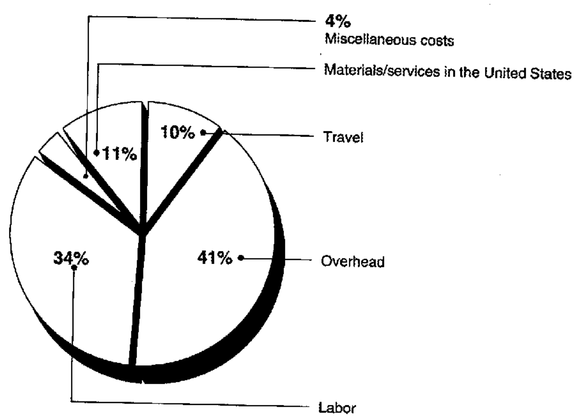


Source: GAO's presentation of data based on information provided by DOE.

U.S. National Laboratories' Expenditures Comprise Majority of U.S. Program Costs to Date

Of the $11.2 million that was spent in the United States for the program, the national laboratories' expenditures made up $10.7 million, or about 96 percent of that amount. DOE's headquarters' expenditures, totaling about $500,000, comprise the remainder of the program funds spent in the United States. DOE's headquarters' expenditures covered, among other things, obtaining studies related to Russia's defense conversion activities and establishing a Website for the program. Regarding the laboratories' expenditures in the United States, these costs were incurred primarily to develop and monitor various NCI projects and activities. According to DOE officials, the laboratories' expenditures represent program startup costs. They noted that the program has taken longer to start up because of the economic problems facing Russia and the barriers involved in trying to start new businesses and related activities in the nuclear cities. Figure 3 shows a breakout of the national laboratories' costs in the United States as of December 2000, and appendix II provides more details about the NCI program's cumulative expenditures.

Figure 3: Breakout of the National Laboratories' Expenditures in the United States Totaling $10.7 Million as of December 2000



Note1: Does not include DOE's headquarters' expenditures.

Note 2: Travel includes travel of U.S. personnel within the United States and Russia.

Source: GAO's presentation of data based on information provided by DOE.

As indicated in figure 3, 75 percent of the funds spent by the laboratories were for overhead and labor costs. Overhead costs comprised the greatest percentage of costs (about 41 percent) and were charged for various activities, such as contract/procurement support and other activities related to the program's implementation. For example, some laboratories charge an overhead fee for administering travel services for both U.S. and Russian officials. The next highest cost was for labor—34 percent. The laboratories have assigned a principal investigator to manage each NCI project. The principal investigators from the laboratories told us that they spent from 5 to 75 percent of their time on monitoring NCI projects. Additionally, they told us they spent most of this time during the early stages of the project to establish contacts with their Russian counterparts and to help develop contracts with Russian organizations in the nuclear cities. As the figure shows, the remaining 25 percent of the U.S. expenditures included travel (airfare and per diem) of laboratory personnel within the United States and to Russia; costs to purchase materials and services for the program, such as U.S.-based consultants; and other miscellaneous costs, such as training, videoconferences, and translation services.

DOE officials told us that they were concerned about the amount of funds spent by the laboratories to administer the program—particularly, the overhead costs. However, these officials believe that the laboratories play an important role in the start up of the NCI program. Some DOE officials, including the program director, stated that laboratory costs would be reduced over time as businesses invest their own capital in the nuclear cities. However, the program director was not sure when the laboratories' role in the program would be reduced.

DOE has taken some steps to reduce laboratory costs as shown in the following examples:

- One laboratory official from the Savannah River Site told us that, in general, overhead for contracts at his site is about 37 percent of the total cost of NCI-related contracts. He subsequently negotiated with DOE an 11-percent overhead rate in fiscal year 2000 for Russian-related programs to include NCI-related contracts. He said this was done to increase the amount of funds going to Russia.
- Some of the NCI projects are being managed directly by DOE's headquarters in an effort to limit national laboratories' overhead expenditures.
- DOE recently took over from a national laboratory the management of a U.S. firm that is responsible for monitoring the day-to-day operations of International Development Centers.[5] NCI program funds were used to pay the laboratory for this supervisory function. According to DOE and laboratory officials, DOE's headquarters assumed this responsibility to reduce the laboratory's costs.

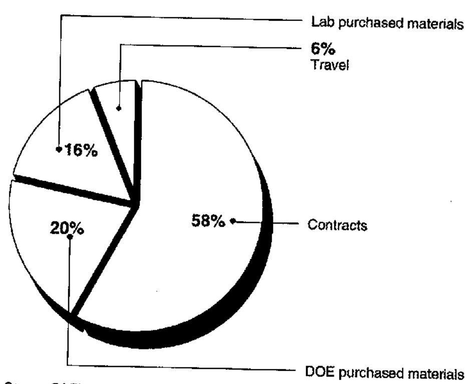
Thirty Percent of NCI Program Funds Spent for Activities in Russia

As of December 2000, NCI program expenditures for projects and activities in Russia totaled $4.7 million, or 30 percent of the $15.9 million spent by the NCI program. As figure 4 shows, the largest category of expenditures (about 58 percent) was for contracts. The contracts were

[5]These centers are funded by the NCI program and operate in two of the nuclear cities. They provide local business owners with training and counseling on preparing business plans and finding sources of capital and work to attract foreign investors to the cities.

used to establish, among other things, the Sarov Open Computing Center. The Center was established in 1999 with NCI funds to help Russian scientists develop commercial skills. According to Center's officials, a portion of these funds was used to supplement the salaries of the Russian scientists. In addition, some of these funds were used to (1) finance the European Bank for Reconstruction and Development's (EBRD) activities to establish a small business bank loan program in the cities and (2) support various community development activities. The materials purchased by DOE and the national laboratories for use in Russia comprised 36 percent of the expenditures and included such things as medical equipment, computers, and payments to Russian consultants/trainers. The remaining expenditures (about 6 percent of the total) were for Russian personnel traveling to the United States.

Figure 4: Breakout of NCI Program Expenditures in Russia Totaling $4.7 Million as of December 2000



Source: GAO's presentation of data based on information provided by DOE.

MINATOM officials told us that they were dissatisfied with the amount of NCI funds that had been spent in Russia. The First Deputy Minister of MINATOM told us that Russia should have received about 65 percent of the funds programmed for NCI, as it was his understanding that DOE had planned to spend that percentage of program funds in Russia. He questioned why Russia had not received the amount he had expected and wanted to know what happened to these funds. The First Deputy Minister also noted that Russia needs help in creating about 1,500 jobs per year in the nuclear cities and that DOE's funding for the program has been insufficient to meet this goal. He concluded that when MINATOM officials review NCI's progress to date, the picture is not optimistic. In his opinion, the lack of progress in the program increases the negative views of the program held by various Russian government officials who allege that the program is a way for the United States to gain access to weapons data in Russia's nuclear cities.

The Congress and DOE have set goals for increasing the amount of NCI program funds spent in Russia. An October 2000 conference report on DOE's appropriations for fiscal year 2001 stated that the conferees were concerned about the amount of funding for Russian assistance programs that remain in the United States for DOE contractors and laboratories rather than going to the facilities in Russia. The conferees directed that not more than 49 percent of NCI program funding be spent in the United States in fiscal year 2001. The conferees expect DOE to continue to increase the level of funding (beyond 51 percent) for Russia in each subsequent year but did not establish a ceiling for the amount of funds that should ultimately be spent in Russia. DOE's NCI Program Guidance, issued in January 2001, noted that in order to meet the spending target established by the conference report, U.S. project managers will spend or commit at least 65 percent of the funds for each project in Russia. DOE officials said they expect overall program expenditures to reach the congressional target of 51 percent if 65 percent of each NCI-project's funds are spent in Russia.

DOE's Lack of Standardized Reporting Procedures Affected Its Ability to Monitor NCI's Expenditures

DOE did not have systematic financial management procedures in place for reporting and tracking NCI's program expenditures. DOE's initial financial guidance for the program, which was issued in May 1999, only noted that an accounting procedure overseen by an experienced budget and fiscal official will include regular monthly reports by the laboratories on individual NCI projects. The guidance was silent on the issue of specific reporting requirements, including how expenditures for U.S. and Russian activities should be identified. Although the national laboratories were generally providing cost information on a monthly basis, a DOE budget official told us that this information lacked consistency and uniformity. As a result, the budget official was not confident that the cost information was accurately depicting the breakout of expenditures between U.S. and Russian activities. For example, in May 2000, DOE developed a breakout of the costs and concluded that 65 percent of the funds had been spent in the United States and 35 percent had been spent in Russia. However, the analysis of Russian expenditures included the funds that were obligated[6] as well as actual expenditures. According to one DOE official, this analysis overstated expenditures in Russia.

Some national laboratory officials told us that the lack of standardized reporting guidance made it difficult to determine how to account for program expenditures in the United States and Russia or what to include in these cost categories. During the course of our review—and, in part, as a result of our work—DOE established a standardized monthly and quarterly financial report for the NCI program. In January 2001, DOE's NCI budget official distributed guidance directing all of the national laboratories to report NCI project costs by using a standard format for identifying expenditures. Furthermore, in its January 2001 program guidance, DOE defined how funds were to be categorized.

- Expenditures in Russia include the costs of Russian officials traveling to the United States, contract payments to Russian organizations, payments to Russian consultants and trainers in Russia, and equipment and materials bought in the United States for Russia or equipment and material bought in Russia.
- Expenditures in the United States include U.S. labor, U.S. travel to Russia, all laboratory overhead, payments to U.S. consultants and trainers in Russia, payments to all interpreters and/or translator services, and equipment and materials bought in the United States for use in the United States.

DOE Has Limited Oversight Over Laboratories' Expenditures

According to DOE program officials, the Department has exercised limited oversight over the national laboratories' use of NCI program funds. Initial DOE program guidance for the NCI program, dated May 1999, did not specifically address financial management procedures for funds disbursed by DOE to the national laboratories and instead relied on existing reporting mechanisms between DOE and the laboratories. According to DOE officials, once funds are transferred to a laboratory, they can be redirected by the laboratory from one project to another. One national laboratory redirected approximately $130,000 from two projects dealing with fiber optics and telecommunications to another project. The NCI

[6] An obligation occurs when a definite commitment has been made or a legal liability is incurred. Funds that have been obligated are not actually spent until the agency makes a payment for goods or services.

program director was not made aware of this transfer until the laboratory requested additional funding from DOE to replenish these projects' funding. On the basis of these experiences, in January 2001, DOE established new guidance stating that the NCI program director must approve the reallocation of funds to other projects.

DOE Has Not Developed a Cost Estimate or Time Frame for the Program's Future Scope and Direction

DOE has not developed a plan, including projected future costs, to gauge the extent to which NCI is meeting its program goals to determine when and under what circumstances it would be appropriate to expand the program beyond the three pilot nuclear cities. In 1999, DOE officials believed the total funding level for NCI could reach $600 million over a 5-year period. However, the Director of the NCI program told us that because the program had not received expected funding levels during its first years of operation, he is uncertain about future program costs and time frames. DOE's former Assistant Deputy Administrator for Arms Control and Nonproliferation told us that each of the pilot cities is expected to receive funding for several years and that the Department needs to develop an "end point" when assistance is completed for each city. NCI is focusing its initial efforts in these three cities plus a weapons assembly plant that is located at Avangard (in the city of Sarov).[7]

DOE has worked jointly with MINATOM and the nuclear cities to develop strategic plans for each pilot city, which include lists of jointly developed project proposals. However, DOE has not developed performance targets that map out its specific contributions to this downsizing effort over time. DOE has stated that key measurements include the number of civilian jobs created, businesses established or expanded, investment in the closed cities, training for Russians, and percentage of funds spent in Russia. While these performance measures are appropriate in a general sense, DOE has not indicated what it hopes to specifically accomplish in these areas over what period of time. Without such targets, it is difficult to determine whether or not the program is on track to meet its long-term objectives. The deputy director of the NCI program told us that DOE is aware of the number of weapons scientists that Russia needs to find jobs for in the nuclear cities but there is no mutually agreed upon number of scientists that DOE plans to help find jobs for. The NCI program director said that DOE would be better able to plan and leverage its own resources

[7]According to DOE, Zarechnyy, another weapons assembly facility, is the next logical city to be added to the NCI program. However, expanding the program to that city has always been predicated upon congressional authorization, available funding, and MINATOM's concurrence.

if it had more information about how MINATOM is budgeting funds for its own specific defense conversion projects.

DOE's NCI Projects Have Had Limited Impact

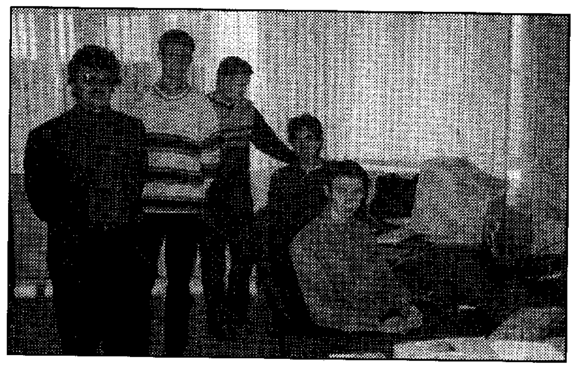
The NCI program has had limited success during its first 2 years. According to DOE, NCI's projects are employing about 370 people, including many weapons scientists, primarily on a part-time basis through research sponsored by the U.S. national laboratories. One project has helped create commercial space in several buildings previously used for nuclear weapons assembly work in the city of Sarov. About half of the NCI projects are not designed to directly lead to employment opportunities for weapons scientists, and Russian officials have criticized DOE's funding decisions. The Department has two programs—NCI and the Initiatives for Proliferation Prevention—operating in Russia's nuclear cities that have a common goal. Having two such programs has caused duplication of effort, such as two sets of project review procedures and several similar types of projects.

Most of the Work Created by NCI Projects for Weapons Scientists Is Part-Time Contract Research for National Laboratories

According to DOE, NCI's projects have generated employment for about 370 people, including weapons scientists, in the nuclear cities. About 40 percent of the work has been generated through the Open Computing Center in Sarov. The purpose of the computing center is to help scientists, mathematicians, and software engineers develop self-sustaining civilian activities, including commercial and contract research.[8] The computing center's director told us that the part-time employees were also working at the weapons design institute in Sarov on weapons-related activities and are receiving salaries from the institute. The employees are working on contract research for the Los Alamos National Laboratory. This work includes several areas of research such as (1) computing and system software development, (2) computer modeling for the oil and gas industry, (3) computer modeling for the strength of materials related to molecular dynamics, and (4) biomolecular modeling. According to a Los Alamos official, while the laboratory has not benefited directly from the research, it has helped enhance the computer-related skills of the center's employees and is making them more attractive to Western businesses.

[8] The Open Computing Center was established in 1999 with support from the NCI program to solve a security problem that arose when a Western computer manufacturer sold 16 high-speed computers to Russia in violation of U.S. export control laws. MINATOM agreed to disassemble the computers and move them from the VNIIEF Institute in Sarov to the Open Computing Center in exchange for financial support for the center from DOE through the NCI program. See *Export Controls: Sales of High Performance Computers to Russia's Nuclear Weapons Laboratories* (GAO/T-NSIAD-97-128).

Figure 5: Russian Weapons Scientists Employed at the Sarov Open Computing Center



The center's director said he hopes that the center will become self-sufficient within 7 years. DOE officials have estimated that, with successful marketing to commercial businesses, the center will be able to employ more than 500 people by 2005. As of December 31, 2000, the NCI program had spent about $1.2 million on computers, site preparation, contracts with the employees of the center, and other expenses. The center has had some success in attracting business investment. For example, an international bank has contracted with the center to develop electronic banking software on a pilot basis. The bank may contract with the center for additional work if the pilot project proves successful. The bank official responsible for this project said he is optimistic that the bank will be able to develop future work for the scientists. The program also introduced programmers at the Open Computing Center to an engineering software company in the United States that was looking for people to help develop software to analyze fluid dynamics in automobile engines and turbines. The software company worked with NCI and national laboratory staff on a pilot project to test the skills of programmers from the center. The NCI program allocated $40,000 to pay the salaries of four Russian scientists working on non-defense-related test problems as well as for the national laboratory's expenses. In early 2001, the software company hosted the scientists in the United States for training. As a result of the training, a commercial contract was signed on March 30, 2001.

Figure 6: Office Building in Which Sarov Open Computing Center Is Located

One NCI Project Has Helped Open Commercial Space at Russian Weapons Facilities

According to DOE, one of the most successful projects involves the conversion of weapons assembly buildings at Avangard into production space for commercial ventures, including the proposed establishment of a kidney dialysis manufacturing facility. DOE has helped facilitate the relationship between a Western business and Avangard and has allocated about $1.5 million to support this effort. For example, DOE said it has spent several hundred thousand dollars to make commercial space available to potential Western businesses. In August 2000, the Secretary of Energy traveled to Sarov to dedicate the newly established commercial space as part of a new "technopark." In addition, the NCI program has continued to help Avangard, MINATOM, and the Western company work together to develop a sustainable commercial relationship. The Western company has been looking for a business partner to help it enter into new promising markets, such as Russia. Avangard has manufactured dialysis machines for several years, and the Western company is hoping to take advantage of those skills while expanding into Russia and parts of Europe. According to DOE, Avangard would devote the majority of its initial efforts to manufacture disposable products that are used for various dialysis treatments.

The NCI program plans to use the remaining project funding to help prepare the buildings for producing the dialysis components, but those funds have not yet been spent. DOE has also allocated $1.25 million from the Initiatives for Proliferation Prevention program to support production development at the site. In January 2001, an official of the Western company said that he was optimistic about starting production by the end of the year. He expected his company to begin installing manufacturing equipment during the summer of 2001. If the project progresses as planned, the company expects to employ about 150 Avangard weapons assembly employees on a full-time basis. The official said that the number of employees could grow to 1,000 over time.

About One-Half of the NCI Projects Are Not Designed to Provide Jobs for Weapons Scientists

About one-half of the NCI projects have been established to fund a variety of activities in the nuclear cities. These projects include infrastructure improvements, cooperation with the European Bank for Reconstruction and Development to provide small business loans that are available to city residents, business training, marketing, and feasibility studies. In addition, these projects include community development efforts, such as youth exchange programs and health care services. According to DOE, while these projects may increase the potential for job creation in the closed cities, they are not all designed to directly lead to new jobs for weapons scientists. DOE officials believe that community development projects are needed to improve the economic and social conditions in the cities in order to make them more attractive to commercial investors. However, MINATOM and weapons institute officials have criticized DOE's decision to fund community development activities and small business loans, claiming that they do not lead directly to employment opportunities or provide sustainable jobs for weapons scientists.

DOE has allocated about $1 million through December 2000 to a dozen separate activities that fall into the category of community development. The activities include school exchange programs, Sister Cities exchange programs, and health care services. According to DOE, community development activities are needed to bolster the cities' ability to provide self-sufficient services, develop municipal capabilities and strengthen citizen and entrepreneurial networks, and build political and economic ties. In addition, DOE officials told us that community development activities are needed to help make the cities more attractive to potential Western investors. However, none of the industry officials whom we talked to during the course of our audit indicated that they would be more likely to invest in the nuclear cities because of municipal and social improvements.

MINATOM officials have stated in the past that while these activities may be worthwhile, they do not support them as part of the NCI program because they will not create jobs. In the May 2000 Joint Steering Committee meeting,[9] a MINATOM official stated that job creation was the primary goal of the NCI program and the 1998 NCI government-to-government agreement. He noted that MINATOM believed that only activities that create real jobs should be included under the NCI agreement and that community development activities, should they continue, need to be covered by a separate agreement. According to DOE officials, the community development component of NCI was considered by the former DOE Assistant Secretary responsible for the program to be a vital activity.

A July 1999 House Appropriations Committee report accompanying the Energy and Water Development Appropriations Bill, 2000, raised concerns about DOE's expertise in implementing the NCI program. The report stated that DOE should work with other federal agencies that are implementing similar programs in Russia. As a result, DOE has attempted to include other agencies in the program's implementation. For example, DOE's community development activities have worked in tandem with other U.S. government agencies. The U.S. Agency for International Development has granted about $387,000 to a U.S. nongovernmental organization to carry out community health care projects in Sarov and Snezhinsk. NCI has also given a grant to this organization to implement

[9] The U.S./Russian Joint Steering Committee, which is made up of senior officials from U.S. and Russian agencies, oversees the NCI program. The Steering Committee meets twice a year to review recent activities and map out future strategies and priorities.

the community health care project in Snezhinsk. These projects are not intended to directly support work by weapons scientists or engineers but to improve the level of health care service in the cities.

One of the NCI program's other major projects has been to enter into a cooperative arrangement with EBRD to extend the bank's Russia Small Business Fund to the nuclear cities. DOE believes that the loan programs are important to diversify the economies of the cities, although the loans are not necessarily assisting weapons scientists. The Department awarded $1.5 million to EBRD in February 2000 for the bank to set up the programs. As of December 2000, the bank had spent over $438,000 of the $1.5 million on salaries for its own staff consultants, to train new loan officers in the cities, and to cover operating expenses. According to the bank, as of February 2001, it had made about 280 loans to businesses in the cities. DOE routinely receives information on the loan program, but that information does not provide details about the background of the loan recipients. However, according to information from EBRD on loans made in Snezhinsk, the recipients are typically not current employees of the weapons institutes and the loans are not necessarily used to start new businesses. Furthermore, the businesses that receive loans are mostly in the retail trading sector, such as clothing and household goods stores. Some MINATOM officials told us that they question the value of the loan programs, noting that the loans are not going to the types of businesses that are appropriate for highly educated weapons scientists. Officials from the weapons institute in Sarov told us that they did not request the loan program and objected to DOE's using NCI funds to start it because it does not play a role in restructuring the workforce. (See app. III for more details about the loan program.)

About One-Third of the NCI Projects Are Designed to Develop Sustainable Commercial Ventures

Eight, or about one-third, of the NCI projects we reviewed are designed to develop sustainable commercial ventures. To date, only one of these has had success in creating jobs; it involves a small company started in Snezhinsk to market and service bar-code technology and other automated devices that are used to identify and inventory property. The Russian company was formed in February 2000 by six former weapons institute employees. According to a national laboratory official, these employees left the institute to form the company. The NCI program allocated $395,000 to the project in fiscal years 1999 and 2000. According to a national laboratory official, the Russian company has used the funds to pay for office space, equipment, and salaries. It also used NCI funds to enter into one contract to receive training and has entered into agreements to distribute and service bar-code and auto-identification technologies manufactured by three U.S. companies.

DOE has canceled several NCI projects that were intended to create jobs for weapons scientists for a variety of reasons. According to DOE, many projects were designed to "jump-start" the program with the expectation that not all would evolve into large-scale jobs creation projects. Furthermore, several of these projects were subsequently determined to not be viable, have run into difficulties, and have either been canceled or stalled. For example, the program funded one project in Zheleznogorsk to expand the capacity for recycling luminescent tubes that contain mercury. DOE allocated $250,000 to this project but spent only $2,000. The national laboratory official responsible for overseeing the project said that MINATOM was not willing to bring the recycling technology out of the restricted part of the city. Because access restrictions prevented DOE from working to expand the recycling capacity within the secure area of the institute, the Department canceled the project.

DOE funded another project to determine the viability of producing canola oil in the Zheleznogorsk region. The oil can be used for cooking and animal feed and can be used industrially to make lubricants, fuels, and soaps. Initial work under the project would have been to determine whether or not the crop could be successfully grown in the area. According to the national laboratory official responsible for overseeing the project, DOE and officials from the weapons institute in Zheleznogorsk were interested in the idea, but the city's mayor was not. The national laboratory official told us that the mayor was more interested in promoting the production of barley for livestock that could also be used to make beer and vodka to bring in tax revenues for the city. The national laboratory official was denied access to the city when she tried to promote the project. DOE allocated $302,000 to the project and spent about $114,000 before canceling it.

Other NCI projects have been canceled or delayed due to a lack of Russian support and cooperation. For example, in the case of one approved project, Russian officials have not provided DOE with business and marketing plans and other financial information, claiming that the information is proprietary or includes trade secrets. According to DOE officials, NCI projects would more likely succeed if Russia demonstrated its support by contributing funds to the projects.

The most successful commercial effort we observed in the nuclear cities involved a major U.S. computer company that employs former weapons scientists in Sarov. This effort, which began about 7 years ago, has been undertaken without U.S. government assistance and now employs about

100 scientists. This commercial venture is discussed in more detail in appendix IV.

NCI Program Faces Numerous Impediments to Success

In addition to the lack of Russian support for some projects, there are numerous other reasons for the limited initial success of the NCI program. These include poor economic conditions in Russia, the remote location and restricted status of the nuclear cities, the lack of an entrepreneurial culture among weapons scientists, and the inadequacy of the NCI program's project selection process. As we reported in November 2000, international aid efforts have had difficulty in promoting economic growth in Russia. The country appears to be a long way from having a competitive market economy, and its transition over the past decade has been more difficult than expected.[10] DOE faces even greater problems in trying to promote economic development in the nuclear cities. The cities are geographically and economically remote. Although the cities have a skilled and well-educated workforce, those residents have depended upon government support for their livelihood and do not generally have experience in business or entrepreneurial ventures.

According to DOE and industry officials, access to the nuclear cities has been a major impediment. The Russian government requires that all visitors apply for an access permit at least 45 days before arriving but does not always grant those requests. DOE provided us with a list of 25 instances since 1999 in which the Russian government denied requests from DOE headquarters staff, national laboratory staff, U.S. embassy personnel, and Members of Congress for access to one or more of the three cities. (See app. V for more detail.) Complications over a request for access even led to the cancellation of a scheduled Joint Steering Committee meeting in November 2000, which the NCI program director considered a major setback to the program. A MINATOM official told us that the access problem is greatly exaggerated, further noting that "hundreds" of officials have visited Russia on behalf of the NCI program. The MINATOM official also told us that access would be even better as more NCI funds reach the nuclear cities.

Notwithstanding the views of MINATOM officials, industry officials told us that the difficulties in obtaining access were a detriment to doing business in the nuclear cities. Several industry representatives told us that the

[10] See *Foreign Assistance: International Efforts to Aid Russia's Transition Have Had Mixed Results* (GAO-01-8, Nov. 1, 2000).

45-day waiting period would cause serious problems for their commercial ventures in the cities. The EBRD official responsible for managing the loan programs also told us that access problems are an impediment to doing business. Because of access problems, EBRD consultants have had to bring people outside of the cities for training. The official also told us that difficulties with access would make it harder to oversee the loans.

NCI's Projects Were Not Adequately Screened

The success of NCI projects has also been limited by the program's failure to rigorously screen projects before approving them. In May 1999, DOE issued a program plan that included a project selection and approval process. NCI program staff were to screen project proposals to determine their suitability with respect to the program's objectives by using a list of criteria developed by the Joint Steering Committee. The criteria included such factors as the number, cost, and sustainability of created jobs, the involvement of industry, and whether the project could enhance Russian weapons technology. The process then called for proposals to be reviewed by (1) one or more of three types of working groups;[11] (2) a technical committee comprising government and nongovernment officials; and (3) other U.S. government agencies and offices within DOE with an interest in aid to Russia.

DOE and national laboratory officials have told us, however, that the implementation of the project approval process to date has been inconsistent and "ad-hoc." DOE officials told us that the program did not have documentation to show how approved projects had moved through the review process. According to the NCI program director, projects were approved for funding without a comprehensive review process in order to implement the program quickly and engage the Russians. In addition, although projects are reviewed by DOE and MINATOM through the workings of the Joint Steering Committee, MINATOM officials have not supported several of the major NCI projects, including the EBRD small business loan programs and the community development projects because they did not directly lead to sustainable jobs for weapons scientists. According to DOE officials, DOE and MINATOM have differing views about what the NCI program should be funding. MINATOM believes that only projects that lead directly to jobs creation should be funded while

[11] DOE envisioned three types of working groups: city working groups that focus on activities particular to individual cities, functional working groups that focus on functional areas (such as business training) relevant to more than one of the cities, and task groups that concentrate on specific projects.

DOE has asserted that many different activities—in addition to jobs creation—need to be addressed as part of the program.

In the National Defense Authorization Act for Fiscal Year 2001, the Congress directed that DOE establish and implement project review procedures for the NCI program before DOE would be allowed to obligate or expend all of its fiscal year 2001 appropriation. The act specified that the procedures shall ensure that any scientific, technical, or commercial NCI project (1) will not enhance Russia's military or weapons of mass destruction capabilities; (2) will not result in the inadvertent transfer or utilization of products or activities under such project for military purposes; (3) will be commercially viable within 3 years; and (4) will be carried out in conjunction with an appropriate commercial, industrial, or nonprofit entity as partner. In response, in January 2001, DOE issued new guidance for the NCI program that includes more detail on the project selection and approval process. For example, the guidelines spell out the process by which DOE will review projects—internally and with interagency assistance—for any military application. The review process is also supposed to confirm that scientific, technical, and commercial projects will have a partner and that they are commercially viable. It is too early to tell how closely DOE will adhere to this project-approval process. In addition, the new guidance states that DOE will give preference, to the extent possible, to those projects with the strongest prospects for early commercial viability and those in which start-up costs are shared with other U.S. government agencies, Russian partners, and/or private entities.

Duplication Has Occurred in the Operation of DOE's Two Programs in Russia's Nuclear Cities

The Nuclear Cities Initiative and the IPP program share a common underlying goal—to employ Russia's weapons scientists in nonmilitary work. Unlike the IPP program, NCI has a community development component that is designed to create conditions necessary for attracting investment in the nuclear cities. The operation of these two similar programs in Russia's nuclear cities has led to some duplication of effort, such as two sets of project review procedures and several similar types of projects.

Both the IPP program and NCI operate in and provide funds to Russia's nuclear cities. Since 1994, DOE has spent over $13 million on about 100 IPP projects in five nuclear cities, including the three nuclear cities participating in the NCI program—Sarov, Snezhinsk, and Zheleznogorsk. According to IPP's Deputy Director, several of the projects have funded the development of promising technologies, such as prosthetic devices and medical implants, nuclear waste clean up technology, and portable monitoring devices to detect nuclear material. He told us that these projects might be commercialized in the next few years. One U.S. national laboratory official told us that there was not a clear distinction between the two programs, and other laboratory officials noted that some projects have been proposed for funding under both programs, shifted from one program to another, or have received funding from both programs. For example, in the case of the kidney dialysis equipment project, NCI has funded infrastructure improvements, and IPP has funded a small planning effort and also plans to fund some activities related to the manufacture of disposable products.

Both the NCI and IPP programs reside within DOE's Office of Defense Nuclear Nonproliferation, National Nuclear Security Administration. In addition, the programs have adjoining offices and share staff to perform budget, travel, and secretarial functions. The Directors of the NCI and IPP program told us that, in their opinion, there was nothing wrong with some overlap in projects or in sharing administrative functions. The IPP program director told us that although he did not believe that the two programs were duplicative, there is potential for duplication to occur because both have a common approach for creating jobs in the nuclear cities.

Some of the failures of the NCI commercial development projects may have been avoided if DOE had a common project approval process and had incorporated some of the elements of the IPP project selection process from the outset of the program. In 1999, we recommended that DOE eliminate those IPP projects that did not have commercial potential. Subsequently, DOE implemented our recommendation and strengthened its project selection process. IPP requires that all proposed projects have an industry partner to help ensure the commercial viability of each project. The IPP program has also relied on the U.S. Industry Coalition[12] to help evaluate and develop commercial projects. In contrast, the NCI program has not established a similar relationship with the Coalition or any other industry group nor has it required an industry partner for its projects. On March 21, 2001, DOE solicited the Coalition's support in disseminating information among its members about the Nuclear Cities Initiative.

[12]The U.S. Industry Coalition, Inc., is a nonprofit association of U.S. companies and universities dedicated to the nonproliferation of weapons of mass destruction through the commercialization of technologies for peaceful purposes. The council receives funding from DOE to carry out its responsibilities with respect to the IPP program.

Most of NCI's initial commercial development projects would not likely have been approved under the IPP program's more rigorous approval process. This is because unlike the IPP program, the NCI program did not require that projects have industry partners or demonstrate commercial viability until January 2001, when program guidance on the subject was issued. In addition, the program has only recently begun to develop a more systematic process, as IPP has, for obtaining the views of business or industry experts on the commercial viability of projects. According to the Deputy Director of the NCI program, DOE is now developing a contract with a consulting firm that will review proposed projects for commercial viability.

In addition, the NCI program has recently adopted practices established under the IPP program regarding the funding of projects. In January 2001, the NCI program required that 65 percent of all project funds be spent in Russia. The guidance is similar to a congressional restriction on the IPP program, which mandates that no more than 35 percent of IPP funds may be obligated or spent by the national laboratories to carry out or provide oversight of any program activities. Moreover, the IPP program has allocated funds to the national laboratories accompanied by approval letters that specify the exact amount of funding to be allocated (and spent) at the laboratories and in Russia. A similar approval letter procedure has only recently been adopted for the NCI program.

Although the programs have many similarities, the level of access to the nuclear cities granted to DOE officials is strikingly different, depending on which program they are representing. For example, officials of the nuclear city of Snezhinsk do not allow DOE and national laboratory officials access to the restricted weapons institutes under NCI. This restriction has impeded the implementation of a few NCI projects. For example, a U.S. national laboratory official told us that he was not granted access to visit a weapons institute in Snezhinsk to observe the equipment being considered for use in an NCI project related to the development of fiber optics. As a result, this project has been canceled. However, the same U.S. official was allowed access to observe this same equipment 2 years earlier when he visited the site under an IPP-sponsored visit.

European Nuclear Cities Initiative Focuses on Employing Scientists in Russia's Nuclear Cities

The European Nuclear Cities Initiative, a proposed program that is being supported by the Italian Ministry of Foreign Affairs, is designed to create jobs in Russia's nuclear cities. This proposal is expected to be smaller in scope than DOE's NCI, but officials responsible for the effort told us that ENCI should complement and support the U.S. program. We found some significant differences between the two programs. For example, ENCI is expected to (1) target older weapons scientists who are considered to pose a greater proliferation risk than younger scientists who could be more easily assimilated into the Russian economy; (2) start in two nuclear cities; and (3) emphasize environmental and energy-efficiency projects. Furthermore, officials responsible for ENCI told us that it will not emphasize establishing sustainable commercial ventures in the cities. Instead, ENCI proposes to fund projects that utilize Russian weapons scientists' skills to help develop environmental and energy-related technologies that can be used by European companies.

The ENCI proposal is expected to complement DOE's program. It has been developed and promoted primarily by an Italian nongovernmental organization known as the Landau Network-Centro Volta[13] and by the Italian National Agency for New Technology, Energy and Environment. It has received support from the Italian Ministry of Foreign Affairs. According to a Landau Network-Centro Volta official, ENCI shares the same basic nonproliferation objectives as DOE's program but will be significantly smaller in scope and size. Furthermore, the European proposal has developed an overall approach and set of proposed activities that differ from the DOE program in several ways. For example, ENCI plans to focus on environmental cleanup and energy-efficiency technology projects that Landau officials believe tap into the strengths of the weapons scientists in the two nuclear cities. Italian officials do not believe that the cities possess sufficient commercial potential to develop sustainable business enterprises in the foreseeable future. As a result, they believe that it makes more sense to develop projects that employ nuclear city weapons scientists as contractors to provide technical assistance to help solve environmental and energy problems in Europe. They also believe that over time, it might be possible to attract Western business partners to enter into commercial relationships with the city if the initial projects prove successful.

[13] The Landau Network-Centro Volta seeks to promote scientific cooperation with institutions and researchers from the former Soviet Union, Eastern Europe, and Asia.

Program Funding Levels Are Uncertain

According to officials from Italy and the European Commission,[14] ENCI will start in two cities—Sarov and Snezhinsk. However, funding for ENCI is uncertain. Italian officials estimated that $50 million will be needed to implement the program over the next 5 years from various donors, including individual countries as well as the European Commission. An Italian Ministry of Foreign Affairs official told us that Italy is considering funding one project in 2001 at a cost of between $500,000 and $800,000.

A European Commission official told us that funding levels would probably be modest because some member states do not perceive that unemployed Russian weapons scientists pose a serious proliferation threat. He noted that many European countries were more concerned about the threat posed by nuclear materials in Russia and are more inclined to fund programs that would ensure greater accountability and control over these materials. Furthermore, this official said that member states of the European Commission want more details about the ENCI proposal before they are willing to make a decision about funding for the program.

In December 2000, the Italian Ministry of Foreign Affairs—in collaboration with the Landau Network-Centro Volta and the Italian National Agency for New Technology, Energy and the Environment—prepared a list of 34 projects proposed by representatives from Sarov and Snezhinsk. These projects are focused on innovative technologies and energy and environmental issues. Some of these proposed projects are designed to

- develop environmental centers in Sarov and Snezhinsk,
- develop renewable energy sources,
- investigate advanced technological components for fuel cells, and
- create energy-efficiency centers in Sarov and Snezhinsk.

The projects are expected to last from 1 to 3 years with costs ranging from about $69,000 to over $1.8 million. Each proposed project assumes that Russia will fund part of the project. Job creation estimates are included in each project proposal and range from 20 to 50 per project. These projects will be submitted to European Commission members for review and are expected to be discussed at an April 2001 ENCI working group meeting.

[14] The European Commission is an organization that, among other things, manages foreign assistance programs for its 15 member states.

Italian officials told us that they hope that the Commission would provide funding for some of these projects after the meeting takes place.

DOE and Russian Officials Express Support for ENCI

DOE officials believe that ENCI will support the goals of the Nuclear Cities Initiative. DOE's NCI program director said that it is important to increase other countries' participation in this effort and believes that both programs can work together in the nuclear cities. Although the director noted that the programs have different strategies for creating jobs for weapons scientists, he believes that both are complementary.

The U.S. government and the European Commission have started to coordinate their assistance efforts in the nuclear cities. In June 2000, the State Department and DOE jointly sent a letter to the Commission encouraging initiatives that (1) complement efforts to promote nuclear nonproliferation, (2) help downsize Russia's nuclear weapons complex, and (3) enhance scientific and technical cooperation with scientists in the closed nuclear cities. The Departments noted that in December 1999, several U.S. government representatives participated in an international forum to discuss ENCI. ENCI was viewed as potentially augmenting ongoing U.S. and other international activities, including the Initiatives for Proliferation Prevention program and the International Science and Technology Center's activities focused on the nuclear cities.

MINATOM officials told us they would welcome assistance through ENCI. They stated that the effort to employ weapons scientists in the nuclear cities is a great challenge and believe that ENCI can contribute to accelerating the pace of Russia's downsizing effort. In a July 2000 letter addressed to the European Commission, MINATOM's first deputy minister stated that Russia supports the efforts of the Commission to help find jobs for weapons scientists. He noted that Russia was ready to begin taking steps to pave the way so that ENCI could begin working in the nuclear cities.

Conclusions

DOE's effort to help Russia create sustainable commercial jobs for its weapons scientists and help downsize its nuclear weapons complex is clearly in our national security interests. It also poses a daunting challenge. The nuclear cities are geographically and economically isolated, access is restricted for security reasons, and weapons scientists are not accustomed to working for commercial businesses. Thus, Western businesses are reluctant to invest in the nuclear cities. However, the successful collaboration of a major U.S. computer firm in the Russian nuclear city of Sarov, without U.S. government assistance, is an example of what can be accomplished over time if the skills of Russia's weapons scientists are properly matched with the needs of business.

Although DOE has had some modest successes with helping Russia create jobs for its weapons scientists and downsize its nuclear weapons complex, we believe that DOE needs to rethink its strategy. A disproportionate percentage of program funds is being spent in the United States—about 70 percent—most of which are going to the U.S. national laboratories instead of to Russia. This is also a major irritant to Russian officials who told us that if DOE is serious about creating jobs in the nuclear cities, a larger percentage of program funds should be spent in Russia. A conference report on DOE's fiscal year 2001 appropriations has directed that no more than 49 percent of Nuclear Cities Initiative funds be spent in the United States and DOE has incorporated this goal into its program guidance. DOE will have to more effectively monitor and control program spending to meet this goal. We are encouraged that one U.S. national laboratory has negotiated lower overhead rates in order to put more resources in Russia and that DOE has taken steps, as a result of our review, to systematically track U.S. and Russian program expenditures. However, DOE has not developed the quantifiable program goals and milestones that are needed to track progress and make decisions about future program expansion to other nuclear cities and the level of resources needed to continue the program.

About one-half of the NCI projects are not designed to create businesses or lead to sustainable employment but rather focus on infrastructure, community development, and other activities. In our view, DOE needs to concentrate its limited program funding on those activities that will most realistically lead to sustainable employment for weapons scientists. Attempting to change the social fabric of the nuclear cities through community development projects, thereby making the cities more attractive to potential investors, may not be a realistic or affordable goal. Furthermore, industry representatives told us that the outcome of these types of projects would have little impact on a company's decision to invest in the nuclear cities. Indeed, MINATOM and weapons institute officials from Sarov have questioned the value of community development projects because they do not create sustainable jobs in the nuclear cities.

While we believe that the above changes are necessary to improve the implementation of NCI, in our view, a more fundamental question needs to be addressed by DOE. Does the Department need two separate programs operating in Russia's nuclear cities with the same underlying goals and, in some cases, the same types of projects? The IPP program and NCI share a common goal—the employment of Russian weapons scientists in alternative, nonmilitary scientific or commercial activities. Combining the two programs could alleviate many of the concerns we have with the implementation of NCI. For example, the IPP program already has established limits on the amount of funds to be spent in the United States and Russia as well as a strengthened project review and selection process that focuses on the commercialization of projects and jobs creation. Furthermore, efficiencies might be gained by combining the administrative structures of both programs, particularly given that the overhead rates at most national laboratories are relatively high. While we are encouraged that DOE has already taken some steps to reduce laboratory costs, there may be additional opportunities for cost savings in this area. Ultimately, the success of DOE's efforts to create jobs for Russia's weapons scientists depends on industry's willingness to invest in the nuclear cities and elsewhere throughout Russia. We believe that there is a limit to what U.S. government assistance can do in this regard. It is instructive to note that the proposed ENCI limits and targets its assistance because of the difficulty involved in creating sustainable commercial businesses in the nuclear cities. We also believe that this is an appropriate time for the Department to take a closer look at the operations of both its programs and determine how they could work more efficiently and effectively as part of a more consolidated effort. This determination should include an analysis of what changes in both programs' authorizing legislation would be required.

Recommendations for Executive Action

We recommend that the Administrator, National Nuclear Security Administration, improve efforts targeted at the nuclear cities by

- evaluating all of the ongoing NCI projects, particularly those that focus on community development activities, and eliminate those that do not support DOE's stated objectives of creating jobs in the nuclear cities and downsizing the Russian nuclear weapons complex;
- establishing quantifiable goals and milestones for jobs creation and downsizing the weapons complex that will more clearly gauge progress in the nuclear cities and use this information to help assess future program expansion plans and potential costs; and
- strengthening efforts to reduce national laboratories' costs to implement the program in an effort to place more NCI funds in Russia.

In addition, the Nuclear Cities Initiative and the Initiatives for Proliferation Prevention program share a common goal and, in many cases, are implementing similar types of projects. In order to maximize limited program resources, we also recommend that the Administrator

- determine whether the two programs should be consolidated into one effort—including a determination of what changes in authorizing legislation would be necessary—with a view toward achieving potential cost savings and other programmatic and administrative efficiencies.

Agency Comments and Our Evaluation

We provided the Department of Energy with copies of a draft of this report for review and comment. DOE's written comments are presented in appendix VII. DOE concurred with our recommendations and provided technical comments that were incorporated in the report as appropriate. DOE provided additional comments on the following issues: (1) job creation and complex downsizing, (2) economic diversification, (3) the similarities between NCI and the IPP program, and (4) program metrics and project review.

DOE noted that our report focused on job creation as the primary measure of NCI success or as the metric for individual activities. In DOE's view, this reflects an inadequate appreciation of the goals of the program. The program's goal is not simply funding the employment of weapons scientists but also downsizing Russia's weapons complex through economic diversification. The outcome of this approach, DOE contends, is sustainable alternative nonweapons jobs that ultimately move scientists out of the weapons facilities. We recognize that Congress has identified the objectives of the NCI program as being both job creation and downsizing Russia's nuclear weapons complex. Although this report focuses more on job creation, we have identified, where appropriate, the downsizing of Russia's weapons complex as another objective of the program. We have focused on the job creation objective for a number of reasons. First, it is highlighted in the government-to-government agreement between the United States and Russia which states that the purpose of the NCI program is to create a framework for cooperation in facilitating civilian production that will provide new jobs for displaced workers in the nuclear cities. Second, the Russian officials we met with told us that they are judging the NCI program by one standard—the creation of sustainable jobs. These Russian officials have criticized community development projects because these projects do not lead directly to employment opportunities or provide sustainable jobs for weapons scientists. In addition, the industry representatives we talked to said that the outcomes of the community development projects would have little impact on their company's decision to invest in the nuclear cities. We continue to believe that DOE needs to concentrate its limited program funding on those projects that will most realistically lead to sustainable employment for weapons scientists.

Regarding economic diversification, DOE stated that MINATOM would prefer that funding be provided directly for major projects through a top down approach that reflects central planning. According to DOE, successful economic diversification efforts in the United States have occurred based on active partnerships among government, industry, and the community, which support entrepreneurship and "growth from below"—a goal endorsed by the NCI program. In our view, DOE's premise that economic diversification approaches in Russia can be modeled after U.S. experiences may be misleading. The economies and social and political structures of the two countries are not comparable. As we noted in our report (1) international aid efforts have had difficulty promoting economic growth in Russia, (2) the country appears to be a long way from having a competitive market economy, and (3) Russia's transition experience over the past decade has been more difficult than expected. Regardless of the approach that is taken to stimulate economic development in the nuclear cities, we continue to believe that DOE faces a daunting challenge in meeting the ambitious goals of the NCI program. We also continue to question, as we did in our 1999 report, whether DOE possesses the expertise needed to develop market-based economies in a formerly closed society.

DOE also noted that our discussion of duplication between NCI and IPP reflects an incomplete understanding of the differing, but complementary, goals of the program. DOE noted that IPP is an older program that focuses on the commercialization of technology inside the weapons institutes of the nuclear cities, while NCI focuses only in the municipal areas of the nuclear cities. In DOE's view, it is not surprising that program managers at the national laboratories might seek funding for the same proposed activity from NCI and IPP. According to DOE, scientists all over the world try to maximize their chances of receiving grants by applying to multiple sources, and such activity does not make NCI and IPP duplicative or automatic candidates for administrative consolidation. While we recognize that differences exist in the implementation of both programs, both programs share a common underlying goal—the employment of Russian weapons scientists in sustainable, alternative, nonmilitary scientific or commercial activities. Therefore, we continue to question whether DOE needs two separate programs with two sets of similar project review procedures funding numerous similar types of projects in the nuclear cities. As noted in the report, we found that some NCI projects have (1) been proposed for funding under both programs, (2) shifted from one program to another, or (3) received funding from both programs. Combining the two programs could also alleviate many of the concerns we have with NCI's implementation such as strengthening the project selection and review process. Furthermore, we continue to believe that efficiencies might be gained by combining both programs.

Finally, DOE noted that the Nuclear Cities Initiative is less than 2-1/2 years old and that project review processes and program metrics need time to mature and be fully implemented. DOE stated that new project review procedures have been instituted to ensure effective coordination and that the program's performance is being measured. While we recognize in the report that new procedures have recently been put into place, it is unclear to us why it took DOE over 2 years to develop and implement these procedures when similar procedures already existed under the IPP program. As noted in the report, some of the failures of the NCI commercial development projects might have been avoided if DOE had a common project approval process and had incorporated some of the elements of the IPP project selection process from the outset of the program. Concerning NCI's program metrics, we recognize in the report that DOE has performance measures, but we continue to believe that these measures require greater specificity. For example, without specific targets, such as the number of scientists that DOE plans to help find jobs for, it is difficult to determine whether the program is on track to meets its long-term objectives. DOE has concurred with our recommendation to establish quantifiable milestones that will more clearly gauge the NCI program's progress in the nuclear cities.

Scope and Methodology

To determine the amount of NCI program funds spent in the United States and Russia, we obtained data from DOE's headquarters and the U.S. national laboratories. Our task was complicated because DOE and the national laboratories were not systematically tracking these types of data. As a result, we developed, in cooperation with DOE's Nuclear Cities Initiative budget officer, a standardized format and agreed-upon definitions for capturing this information for each laboratory by various cost components, such as salary and benefits, overhead, and travel. The format also was used to help identify program expenditures in the United States and Russia. We reviewed the data submissions from the laboratories to ensure that the program expenditures were grouped by the appropriate expenditure categories. We had numerous discussions with DOE and several national laboratories' financial officers to ensure that the data were consistent and conformed with agreed-upon definitions of what comprised U.S. and Russian costs. In cooperation with the NCI program office, we reviewed all of the cost data submitted by the national laboratories to ensure that expenditures were consistently categorized. In several instances, we worked directly with national laboratory program and finance officials to clarify and/or supplement cost data they had provided us with.

To assess the NCI projects and their impact, we reviewed all of the projects that had been implemented by DOE. We developed a list of projects from information provided by DOE and the U.S. national laboratories. We made some judgments in order to arrive at a final list of projects to review. For example, we excluded activities involving the development of strategic plans, workshops, and other support activities because, while these efforts support the program, we did not consider them to be projects in their own right. In addition, we decided to consider all of the community development activities as one project because those activities involved relatively small expenditures of funds. The NCI program staff concurred with these and other judgments we made about the projects. (See app. VI for a list of projects reviewed.)

To assess the impact of the NCI projects, we used, whenever possible, the information contained in DOE's NCI database to determine the extent to which each project focused on critical nonproliferation objectives, such as the number of weapons scientists engaged in the project and its potential commercialization benefits. However, we found that the database did not always contain current information. We also met or spoke with the principal investigator for each project or a representative who was familiar with the project. We discussed how projects were meeting these objectives and what role the investigator played in meeting these objectives. We met or spoke with officials from the following national laboratories to discuss NCI projects: Argonne National Laboratory, Oak Ridge National Laboratory, Pacific Northwest National Laboratory, Sandia National Laboratory, Lawrence Livermore National Laboratory, Los Alamos National Laboratory, National Energy Technology Laboratory, Westinghouse Savannah River Company, and the Kansas City Plant. We also met with representatives from DOE to discuss those projects that were being managed by DOE's headquarters. During the course of our work, we also met with or had discussions with officials from the Department of Commerce, the Department of State, the U.S. Agency for International Development, the U.S. Industry Coalition, Inc., the U.S. Civilian Research and Development Foundation, and the European Bank for Reconstruction and Development.

In several instances, we contacted industry officials to follow up on the status of commercialization activities and obtain their views about trying to start businesses in the nuclear cities. For example, we discussed selected projects and related commercial activities with officials from

ADAPCO, Fresenius Medical Care, Credit Suisse First Boston (Europe), Motorola, Oracle, Intel Corporation, and Delphi Automotive Systems. We toured the All-Russian Scientific Research Institute of Experimental Physics (VNIIEF) Software Technology Laboratory in Sarov, which is the company that a Western firm contracts with for software development.

We visited Russia in September 2000 to meet with MINATOM officials in Moscow, including the first deputy minister. We traveled to Sarov to meet with representatives from VNIIEF and Avangard, the weapons assembly facility that is located in Sarov. During our visit to Sarov, we asked to visit the Avangard facility, but our request was denied. While in Sarov, we visited the Open Computing Center and met with numerous weapons scientists who were working there. We also visited the Analytical Center for Nonproliferation (one of the projects) and VNIIEF Conversia, the organization that seeks to develop commercial ventures in the city. We also met with the deputy mayor of Sarov to learn more about the economic and social conditions in that city. We also met with representatives from the nuclear city of Snezhinsk during our visit to Moscow.

To obtain information about the status of the European Nuclear Cities Initiative, we visited Rome, Italy, and Brussels, Belgium, in January 2001. While in Rome, we met with officials from Italy's Ministry of Foreign Affairs, the Landau Network-Centro Volta, and the Italian National Agency for New Technology, Energy and the Environment. In Brussels, we met with representatives from the European Commission's Security Policy and External Relations Directorate. We conducted our work from August 2000 through April 2001 in accordance with generally accepted government auditing standards.

As agreed with your offices, unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days after the date of this letter. At that time, we will send copies of this report to the Honorable Spencer Abraham, Secretary of Energy; John A. Gordon, Administrator, National Nuclear Security Administration, the Honorable Mitchell E. Daniels, Director, Office of Management and Budget; and interested congressional committees. We will make copies available to others upon request.

If you have any questions concerning this report, I can be reached at (202) 512-3841. Major contributors to this report include Gene Aloise, Ross Campbell, Glen Levis, and Joseph O. McBride.

Gary L Jones

(Ms.) Gary Jones
Director, Natural Resources
and Environment

Appendix I: Role of Russia's Nuclear Cities in Weapons Design and Development

This appendix provides information on Russia's nuclear cities and their role in developing nuclear weapons.

Table 1: Role of Russia's Nuclear Cities in Weapons Design and Development

Name	Nuclear role
Sarov[a]	Nuclear weapons design and assembly, plutonium storage
Zarechnyy	Nuclear weapons assembly and disassembly, plutonium and highly enriched uranium storage
Novouralsk	Uranium enrichment, highly enriched uranium storage and blending
Lesnoy	Nuclear weapons assembly and disassembly, plutonium storage
Ozersk	Mayak Fuel Storage Site: fuel fabrication, mixed oxide fuel, plutonium production reactors, reprocessing, waste management
Snezhinsk	Nuclear weapons design, plutonium and highly enriched uranium storage
Trekhgornyy	Nuclear weapons assembly and disassembly, plutonium and highly enriched uranium storage
Seversk	Uranium enrichment and reprocessing, plutonium production reactors, waste management
Zheleznogorsk	Reprocessing, plutonium production reactors, waste management
Zelenogorsk	Fuel fabrication (military), uranium enrichment

[a]Avangard, a weapons assembly and disassembly facility, is located in Sarov.

Source: Department of Energy.

Appendix II: NCI's Cumulative Expenditures as of December 2000

This appendix presents detailed information about the cumulative costs incurred, as of December 2000, by the national laboratories and the Department of Energy's headquarters, to implement the Nuclear Cities Initiative program.

Table 2: NCI's Cumulative Expenditures by DOE and National Laboratories as of December 2000

Organizations	Labor[a]	Travel[b]	Material purchased in the United States[c]	Material purchased for Russia[c]	Other costs[d]	Overhead[e]	Total	Percentage of total
ANL	$107,409	$19,031	$25,461	$0	$81	$40,716	$192,698	1
BNL	40,000	9,500	1,700	0	14,500	46,200	111,900	1
KCP	7,323	11,595	19,145	0	0	30,215	68,278	[f]
LANL	560,756	246,180	52,298	1,794,965	69,545	599,367	3,323,111	21
LLNL	1,273,729	448,027	84,811	646,117	231,721	2,023,487	4,707,892	29
NETL	0	27,680	285,680	0	0	0	313,360	2
ORNL	560,300	223,900	21,200	110,000	0	90,600	1,006,000	6
PNNL	796,200	124,400	504,300	767,400	14,200	1,174,400	3,380,900	21
SNL	253,000	108,200	117,500	0	66,900	327,100	872,700	5
WSRC	18,595	121,789	113,787	171,747	22,250	79,061	527,229	3
DOE HQ	0	0	495,612	966,406	0	0	1,462,018	9
Total	**$3,617,312**	**$1,340,302**	**$1,721,494**	**$4,456,635**	**$419,197**	**$4,411,146**	**$15,966,086**	**98[g]**

Legend:

ANL = Argonne National Laboratory

BNL = Brookhaven National Laboratory

DOE HQ = Department of Energy's headquarters

KCP = Kansas City Plant

LANL = Los Alamos National Laboratory

LLNL = Lawrence Livermore National Laboratory

NETL = National Energy Technology Laboratory

ORNL = Oak Ridge National Laboratory

PNNL = Pacific Northwest National Laboratory

SNL = Sandia National Laboratories

WSRC = Westinghouse Savannah River Company

Note: This table provides information on total expenditures associated with the NCI program through December 31, 2000. This table breaks out costs differently than figures 3 and 4 in the report. For example, this table combines all travel costs and does not break these costs out by expenditures in the United States or Russia. Furthermore, all overhead charges for labor, travel, contracts, and materials purchased are combined as one figure for each organization.

[a] Includes salaries, wages, fringe benefits, and pensions that are directly chargeable to the NCI program. DOE's headquarters employees' salaries are not charged directly to the program but are funded through DOE's Office of Nonproliferation and National Security's program direction account. DOE estimated that salaries and expenses for headquarters employees, including contractors, assigned to the NCI program totaled $1,245,322 for fiscal year 2000.

[b] Includes both travel and per diem costs—foreign and domestic—of laboratory officials and travel of Russian officials to the United States. DOE's headquarters' travel costs are funded through DOE's Office of Nonproliferation and National Security's program direction account and totaled $106,330 in fiscal year 2000.

[c] Includes directly applicable purchase orders, contracts (both foreign and domestic), and consulting services.

[d] Includes the costs of certain centralized services, such as document translation, translators/interpreters, in-country support, videoconferences, training, publications, and the costs of hosting delegations.

[e] Includes charges for organizational overhead, general and administrative expenses, and service assessments. Overhead costs are also allocated for processing travel arrangements for both U.S. and Russian personnel.

[f] Less than 1 percent.

[g] Total does not equal 100 percent because of rounding.

Source: GAO's presentation of data from DOE.

Appendix III: DOE's Small Business Loan Program in Russia's Nuclear Cities

In February 2000, DOE granted $1.5 million to the European Bank for Reconstruction and Development (EBRD) to establish small-loan programs in the three nuclear cities. EBRD is using local branches of Sberbank, which is the largest commercial bank in Russia, to implement the loan program in the cities. As of the end of December 2000, EBRD had spent about $440,000 of the $1.5 million. About 74 percent of those expenditures paid for the salaries of the EBRD employees who set up the loan programs and act as consultants. The remaining expenditures were used to train and employ 10 new loan officers hired from within the cities, train other potential loan officers, and cover standard operating expenses, such as office rent, communications, and travel.

EBRD requested NCI funds to cover the administrative costs of the loan programs for the first 18 months of operation. Thereafter, the expectation is that the programs will be self-sustaining on the basis of the proceeds from loan repayments. According to the EBRD representative responsible for overseeing the loan programs, the bank is likely to request an extension from DOE if it has not spent the $1.5 million by the end of the 18-month period.

The new loan departments in the Sberbank branches may borrow from EBRD's existing $300 million Russian Small Business Fund. While EBRD has not set aside loan capital specifically for the three cities, business owners in Sarov, Snezhinsk, and Zheleznogorsk are now able to work with local loan officers to compete with other Russian businesses for micro loans (up to $30,000) and small loans (up to $125,000) from EBRD. Applicants can receive both a micro and small loan at the same time.

As of the end of February 2001, EBRD had issued 279 loans totaling over $1,080,000. Nearly all of the loans were micro loans, and the average size was $3,879. EBRD reported that none of the loans were in arrears more than 30 days. The EBRD representative responsible for the program has projected that the level of loan activity will increase from about 30 loans per month in late 2000 to 130 per month by June 2002. If that level of activity is reached, the bank estimates that it will have issued over 1,600 loans totaling about $9 million by June 2002. The representative also told us in February 2001 that she expected a total of 18 loan officers to be employed in the cities in the near future.

DOE does not have good information on whether loan recipients were former weapons institute employees. What the Department has learned about the loan recipients in Snezhinsk—which it believes is representative of the three cities—suggests that most of the loans have gone to small retail and wholesale businesses, including food and household goods merchants. Information supplied by EBRD for loans in Snezhinsk through July 2000 showed that about one-third of the recipients were former institute engineers, physicists, or computer specialists, including some who left the institute in the early 1990s. According to the EBRD representative, the bank does not target loans to specific types of businesses, nor is EBRD concerned about placing limits on who is employed in the businesses that receive loans. The bank is interested in helping to create a sound economy in the cities that will include businesses that might employ spouses or children of weapons scientists and not just weapons scientists themselves. As EBRD has sufficient loan funds, it does not see any reason to ration these funds to a specific group while denying access to others, given that any economic activity in the cities is a benefit. The representative also said that EBRD probably would not have gone into Sarov, Snezhinsk, or Zheleznogorsk without NCI support.

A former NCI staff person who was responsible for overseeing the grant to EBRD wrote that because virtually all inhabitants of the cities are employees of the institutes or dependents of employees, loans to small retail businesses are helping to foster entrepreneurial skills among institute employees or their dependents. In addition, the loan programs are helping to diversify the economy of the cities. Russian officials were critical of the loan program. According to a Deputy Director at VNIIEF, there was no coordination with the institute on the decision for NCI to support the loan program. He also said that the EBRD loans do not play a role in restructuring the VNIIEF workforce.

The First Deputy Director of MINATOM told us that in his view, the EBRD loan program is inefficient. He noted that the loans are small and the interest rates high (about 38 percent). The bank loans result in a very fast turnover of capital and do not result in production facilities that create self-sustaining enterprises. In his view, butcher shops and flower shops are good, but they do not resolve the fundamental problem of promoting self-sufficiency for weapons scientists.

Appendix IV: Successful Commercial Venture Established in Sarov Without U.S. Government Assistance

During the course of our review, we found that a major U.S. computer company employs former weapons scientists in Sarov and has done so without U.S. government assistance. According to the company official responsible for the work in Sarov, in the early 1990s, a Russian-speaking employee of the company who was familiar with the skills available in the nuclear cities pursued the idea of starting an operation in Russia. A representative of the U.S. company met with officials from Sarov and determined that the company could benefit by taking advantage of the scientists' skills in mathematics and attractive salary scale. Over the past 7 years, the number of former weapons scientists under contract to the U.S. company has grown from less than 10 to about 100. Although the software operation in Sarov is partly owned by the weapons institute in that city—the All-Russian Scientific Research Institute of Experimental Physics—the scientists are no longer employed by the weapons institute. When we visited the software operation in September 2000, we were told that the employees work full time and that their salaries are up to three times what they had been paid at the weapons institute.

The official who oversees the work in Sarov also told us that other technology firms have expressed an interest in working in the closed cities but have not made the commitment. He said that, while his company has been very pleased with the productivity of the operation in Sarov, it is difficult for Western companies to work in Russia because of language problems, restricted access, and the lack of a relationship with the Russian government. For example, gaining access to Sarov on a regular basis has been difficult for his company, although it has become easier. He believes that the NCI program can help Western businesses overcome these obstacles by, among other things, keeping channels of communication open with MINATOM and nuclear city officials. At the same time, he suggested that the program should concentrate its efforts on projects that will play to the strengths of the Russians. For example, he believes that projects that attempt to link the research and analytical skills of the scientists with the needs of Western companies will be more likely to succeed than projects that attempt to start new commercial ventures in the closed cities.

Appendix V: Denials of Access Requests to Three of Russia's Nuclear Cities

This appendix presents information on 25 instances since 1999 in which the Russian government denied requests for access to nuclear cities made by DOE staff and others. According to DOE officials, some requests were denied more than once, while a significant number of requests were approved at a later date.

Table 3: Denials of Access Requests to Russia's Nuclear Cities

Proposed departure dates	Destination	Traveler(s)
Feb. 2001	Sarov	NCI and national laboratory staff
Feb. 2001	Zheleznogorsk	NCI and national laboratory staff
Nov. 2000	Snezhinsk	Senior DOE managers
Nov. 2000	Sarov	NCI and national laboratory staff
Nov. 2000	Zheleznogorsk	U.S. Embassy official
Oct. 2000	Sarov	National laboratory staff
Aug. 2000	Sarov	NCI and national laboratory staff, U.S. Embassy staff, and press reporter
June 2000	Zheleznogorsk	NCI and national laboratory staff and a subcontractor
June 2000	Snezhinsk	National laboratory staff
June 2000	Sarov	Representative of American Association for the Advancement of Science
June 2000	Zheleznogorsk	NCI and national laboratory staff
May 2000	Zheleznogorsk	DOE headquarters and national laboratory staff
Mar. 2000	Zheleznogorsk	DOE headquarters and national laboratory staff and members of the Zheleznogorsk Strategic Planning Team
Mar. 2000	Zheleznogorsk	NCI and national laboratory staff and a subcontractor
Feb. 2000	Sarov	Commander-in-Chief of Strategic Command, DOE senior managers
Feb. 2000	Zheleznogorsk	NCI and national laboratory staff and a subcontractor
Jan. 2000	Zheleznogorsk and Snezhinsk	National laboratory staff
Jan. 2000	Zheleznogorsk	International Development Center Working Group members from national laboratory and its subcontractors
Nov. 1999	Sarov	NCI Sarov Working Group members and university professor
Oct. 1999	Zheleznogorsk	NCI and national laboratory staff and press members
Oct. 1999	Zheleznogorsk	NCI Zheleznogorsk Working Group members
Oct. 1999	Snezhinsk	NCI Snezhinsk Working Group members and private company representative
Sept. 1999	Snezhinsk	National laboratory staff
Fall 1999	Sarov	U.S. Senator
Spring 1999	Snezhinsk	U.S. Member of House of Representatives

Note: Working Groups may include staff from the NCI program, national laboratories, and nongovernmental entities, such as industry representatives.

Source: DOE.

Appendix VI: NCI Projects Reviewed by GAO

Table 4: NCI Projects Reviewed by GAO

Purpose	Status	Location	Allocated funding through December 2000[a]	Responsible DOE entity
Demonstrate programming skills of Open Computing Center staff to potential private customer	Active	Sarov	$40,000	Argonne
Develop analytical centers to conduct research on nonproliferation issues	Active	Sarov/Snezhinsk	439,100	DOE headquarters
Implement numerous community development projects[b]	Active	All three cities	1,077,159	DOE headquarters
Establish small business loan programs through the European Bank for Reconstruction and Development	Active	All three cities	1,500,000	DOE headquarters
Attempt to match Western businesses with production staff from Avangard assembly plant	Active	Sarov/Avangard	100,000	Kansas City Plant
Prepare public information documents and presentations on nuclear cities	Active	All three cities	150,000	Kansas City Plant
Establish Sarov Open Computing Center	Active	Sarov	4,338,000	Los Alamos
Develop infrastructure for production of kidney dialysis equipment	Active	Sarov/Avangard	1,530,000	Lawrence Livermore
Modernize fiber optic production to meet international standards	Canceled	Snezhinsk	120,000	Lawrence Livermore
Develop oil well perforators for potential commercialization	Active	Snezhinsk	167,000	Lawrence Livermore
Establish Snezhinsk Open Computing Center	Active	Snezhinsk	2,621,500	Lawrence Livermore
Upgrade telecommunications service	Active	All three cities	820,000	Lawrence Livermore/Sandia
Prepare "roadmap" that explores viability of fuel cell industry in Russia	Completed	Sarov and Snezhinsk	263,000	National Energy Technology
Establish self-supporting company for barcoding and other automated technologies	Active	Snezhinsk	395,000	Oak Ridge
Develop agricultural products from canola oil	Canceled	Zheleznogorsk	302,000	Oak Ridge
Expand the local capacity for recycling mercury lamps to meet Russian environmental laws	Canceled	Zheleznogorsk	250,000	Oak Ridge
Assess skills and training needed to improve employment opportunities for residents	Completed	Zheleznogorsk	150,000	Oak Ridge
Market analysis for a bottle manufacturing plant	Canceled	Snezhinsk	200,000	Pacific Northwest
Establish International Development Centers to promote business opportunities in cities	Active	Snezhinsk/ Zheleznogorsk	2,000,000	Pacific Northwest
Develop commercial production of medical bandages	Active	Zheleznogorsk	275,000	Sandia
Explore feasibility of establishing rare	Active	Zheleznogorsk	300,000	Sandia

Purpose	Status	Location	Allocated funding through December 2000[a]	Responsible DOE entity
earth metals foundry				
Provide business management training to institute employees and city residents	Active	Sarov	17,850	Savannah River Site
Work with U.S. university to develop Telemedicine Center in Russia	Active	Sarov	269,600	Savannah River Site
Provide laparoscopy equipment for Telemedicine Center	Active	Sarov	281,300	Savannah River Site
Staff from Open Computing Center will perform contract research for national laboratory	Active	Sarov	20,000	Savannah River Site
Total allocated funding			**$17,626,509**	

Note: According to DOE, the allocated amounts for each project include an estimate of overhead costs.

[a]The amount of funds allocated refers to the NCI funds designated for each project, not the amount of funds spent.

[b]The community development projects include such activities as school exchange programs, health care services, and Sister Cities exchange programs.

Appendix VII: Comments From the Department of Energy

Department of Energy
National Nuclear Security Administration
Washington, DC 20585

April 6, 2001

Ms. Gary L. Jones
Director
Natural Resources and Environment
General Accounting Office
Washington, DC 20548

Dear Ms. Jones:

The National Nuclear Security Administration, Office of Defense Nuclear Nonproliferation, has reviewed the General Accounting Office (GAO) draft report, GAO-01-429, entitled "Nuclear Nonproliferation: DOE's Efforts to Assist Weapons Scientists in Russia's Nuclear Cities Face Challenges."

I am pleased that GAO concluded that "DOE's effort to help Russia create sustainable commercial jobs for its weapons scientists and help downsize its nuclear weapons complex is clearly in our national security interests." I also agree with your assessment that the Nuclear Cities Initiative (NCI) "poses a daunting challenge" in its implementation. NCI fills a unique role in the suite of U.S. Government nonproliferation programs and should be recognized for its achievements. It is the only program working with the Ministry of Atomic Energy on weapons complex downsizing and closure. It complements, but does not duplicate, other programs, such as the Initiatives for Proliferation Prevention, the U.S. Civilian Research and Development Foundation, and the International Science and Technology Center.

NCI is a new program, barely two and a half years old. It has already achieved a major impact. To date, NCI has formalized a Government-to-Government Agreement with Russia; developed an effective mechanism for U.S./Russian and U.S. interagency coordination; achieved real successes in the cities, such as the Open Computing Centers, the International Development Centers, and the Avangard Technopark; and funded projects that have the potential to become vehicles for significant and sustained job creation. Recognizing the difficulties encountered and the cost involved in weapons complex downsizing in the U.S., and the challenges faced in Russia, the NCI has done a creditable job of managing both start-up and implementation. As the program matures, issues identified through self-examination and by GAO will continue to be addressed.

This office appreciates the opportunity to have reviewed the draft report. Specific comments are attached.

Sincerely,

Kenneth E. Baker
Acting Deputy Administrator for
Defense Nuclear Nonproliferation

Printed with soy ink on recycled paper

Comments on
GAO Draft Report
"NUCLEAR NONPROLIFERATION:
DOE's Efforts to Assist Weapons Scientists in Russia's Nuclear Cities Face Challenges
(GAO-01-429)"

General Comments

DOE appreciates the opportunity to review the draft General Accounting Office (GAO) report, "Nuclear Nonproliferation: DOE's Efforts to Assist Weapons Scientists in Russia's Nuclear Cities Face Challenges."

Job Creation, Complex Downsizing and Economic Diversification

The report focuses on job creation as the primary measure of NCI program success, or as the metric of success for individual activities. This reflects an inadequate appreciation of the goals of the program and the U.S. experience with downsizing its own nuclear weapons complex. Unlike other U.S. programs in Russia, the goal of NCI is not simply funding employment of weapons scientists. Such an approach, while useful, is only a short-term fix. The goal of NCI is nuclear weapons complex downsizing through economic diversification in these closed cities. The outcome of this approach is sustainable alternative non-weapons jobs, within a functioning city economy, that ultimately move the scientists out of the weapons facilities.

NCI support for the creation of a Technopark at Avangard, carving out a 500,000 sq.ft. location for commercial activities and contributing to the irreversibility of downsizing at this weapons assembly/disassembly facility, is an example of an infrastructure activity unique to NCI with a longer-term potential for economic diversification leading to job creation.

The infrastructure necessary to promote economic diversification includes internet access, telecommunications capability, business training and financing, municipal governance and appropriate transportation capacity. All of these activities and facilities have been effectively and usefully supported by NCI.

The International Development Centers (IDCs), sponsored by NCI in Snezhinsk and Zheleznogorsk, are good examples of programs that improve the business climate in the city making them more attractive to investors. NCI has documented that these facilities are being used both by residents interested in developing businesses and by potential investors. For example, through training on Project Expert software to assist in proposal formulation, the IDC enabled Zheleznogorsk entrepreneurs to realize the equivalent of $17 million in conversion grants from the Russian Government. Because of this success, MinAtom has asked the IDCs to play a role in the administration of its conversion programs.

The GAO report cites MinAtom's official dissatisfaction with the amount of NCI funds spent in Russia. MinAtom, based on its Soviet experience, would prefer that funding be provided directly to major projects, a top down approach that reflects the central planning institutional habit. In the United States, economic diversification, where it has been successful, has been based on an active partnership among government, industry and the community. This approach supports entrepreneurship and growth from below, which are goals the NCI program supports.

NCI and IPP

The discussion of duplication between NCI and IPP reflects an incomplete understanding of the differing, but complementary, goals of the two programs. The difference is not that NCI has a community development component. NCI is seeking to accelerate the reduction of the Russia's nuclear weapons complex – its physical ability to manufacture weapons. The program has converted machine shops and processing facilities from weapons work to civilian use, reduced the footprint of one major Russian nuclear complex, and taken high-performance U.S. origin computers from weapons-design work and moved them to civilian activities. This work makes an important, direct contribution to U.S. national security by helping to downsize Russia's remaining nuclear weapons manufacturing infrastructure.

The programs also differ in scope and methodology. IPP focuses on commercialization of technology inside the weapons institutes. Although narrower than NCI in its focus on technology commercialization, IPP is broader in its focus on areas outside the Russian Federation, and on chemical and biological as well as nuclear facilities. NCI has a Government-to-Government Agreement that, among other things, specifies that the program will carry out work only in the municipal areas of the cities, protects it from taxation, and establishes a formal relationship with MinAtom.

It is not surprising that program managers at the national laboratories, like scientists everywhere, might seek funding for the same proposed activity from NCI and IPP. Scientists the world over try to maximize their chances of receiving grants by applying to multiple sources. Such activity does not in itself make NCI and IPP duplicative or automatic candidates for administrative consolidation. And it certainly isn't under the control of the NCI program office. While there may be opportunity for the programs to learn from each other, this has already occurred to a great extent.

Program Metrics and Project Review

NCI is a very new program, less than two and a half years old. It does not need a new strategy as much as it needs the time to mature and fully implement the management processes that have been put in place. As the report indirectly acknowledges, both through its own efforts, through the model of other programs such as IPP, and through suggestions from GAO, NCI now has instituted the necessary laboratory guidance and project review procedures to ensure effective coordination of program activities.

Moreover, the NCI program plan specifies the metrics that are being used to measure program performance. Performance assessment is a critical component of NCI program management to ensure program goals are being met. These metrics include:

- Facility Closure (number of buildings, square footage, etc.)
- Infrastructure Upgraded or Created
- Jobs Created
- Businesses Established or Expanded
- Credits and Investment Provided to Local Businesses
- External Financing and Leveraged Funds
- Training Courses Provided and Number of People Trained
- Number and Types of Commercial Firms Investing in the Cities
- Percentage of Project Funds Spent in Russia
- Services Provided by the International Development Centers
- Other Development Programs Attached to the Cities
- Russian Monetary and In-Kind Contributions

Recommendations

We recommend that the Administrator, National Nuclear Security Administration improve efforts targeted at the nuclear cities by

Recommendation 1.

Evaluating all of the ongoing NCI projects, particularly those that focus on community development activities, and eliminate those that do not support the Department's stated objectives of creating jobs in the nuclear cities and downsizing the Russian nuclear weapons complex;

Management Position

Concur

Evaluation of all of the ongoing NCI projects is appropriate, however not simply for the purpose of eliminating projects. Evaluation of projects will be for the purpose of enhancing those projects that are supporting the program goals, and correcting those which are not, reserving the option of eliminating those that cannot be redirected to support the program goals.

Recommendation 2.

Establishing quantifiable goals and milestones for jobs creation and downsizing the weapons complex that will more clearly gauge progress in the nuclear cities and use this information to help assess future program expansion plans and potential costs;

Management Position

Concur

A number of quantifiable goals and milestones already exist. The program will review and extend these as directed in the recommendation.

Recommendation 3.

Strengthening efforts to reduce national laboratory costs to implement the program in an effort to place more NCI funds in Russia;

Management Position

Concur

The NNSA will work to increase non-governmental and business participation, thus reducing national laboratory costs to implement the program. This will help to place more NCI funds in Russia.

In addition, the Nuclear Cities Initiative and the Initiatives for Proliferation Prevention program share a common goal and in many cases are implementing similar types of projects. In order to maximize limited program resources, we also recommend that the Administrator

Recommendation 4.

Determine whether the two programs should be consolidated into one effort–including a determination of what changes in authorizing legislation would be necessary–with a view toward achieving potential cost savings and other programmatic and administrative efficiencies.

Management Position

Concur

NNSA will review the NCI and IPP programs for consolidation with a view toward achieving potential cost savings and other programmatic and administrative efficiencies.

Senator ROBERTS. General Gordon, in some ways I think perhaps if we were a month down the road or maybe 2 or even 3 months down the road, we might be better served with an ability to respond to some of these questions, and that is a timing issue, that obviously you do not have your full team up and running.

But you have indicated that hopefully that will be done in 2 or 3 weeks or at least a month. Then the administration is conducting a review. They have made a budget request, but that is dependent, as I understand it, on the review that they are conducting. There may be some flexibility in that regard.

You are conducting your own review in regards to the IPP and NCI programs. So we have three very time-sensitive considerations here. First, to make sure that you have your team up and running; second, the review by the administration reflects that any changes in the budget request; third, your own review.

I am not finding fault with this. This is just the way things are under the circumstances, but tempis fugit and time marches on in how the authorizers and appropriators work around this place. While we have a little bit of time, it really is not very much.

Can you give us a general estimate? I am not trying to pin you down. Many of these things, two of them at least, well, all three of them really you have no way of speeding that up other than to plead your case before the administration.

But could you comment on these three items in regards to when we might be up and running with team Gordon?

General GORDON. With respect to the administration's review that's under way, most if not all of the programs have been presented to the review panels. So they are beginning to wrestle with their decisions—with their recommendation process. I frankly don't know how long it will take to write that up.

But the process has been very interactive with meetings held several days each week, in looking at each of the programs, not just DOE programs and NNSA programs, but other programs across the government and looking at them comprehensively. The technical part of that work is basically wrapping up now in real time.

Senator ROBERTS. Are we about a month away, 2 months? I do not mean to be picky about this, but we do have an appropriations process to get through, and we have to treat the appropriators well.

General GORDON. I can't speak for them, but that would certainly be the time frame I'm thinking of it. About a month or so is the kind of time frame but that's only an estimate.

Senator ROBERTS. If you could relay to the folks in charge that the Roberts-Landrieu team was getting a little testy on the issue.

General GORDON. There's probably a little of that among the people trying to implement the programs too because we don't want to go down a road or make a major investment or commitment and find out we're a little bit out of sync with the overall approach that the administration would have us take in these programs. Should we show common interest in them, Mr. Chairman?

With respect to internal work, we will all want to tie that to the new member of the team as soon as the deputy administrator is there, and it won't take very long to do that.

Senator ROBERTS. Isn't that name going to be forthcoming very quickly?

General GORDON. I'm hopeful that it is within 2 weeks or less. But, again, we're just waiting for the announcement to be made by the President.

But what I want to comment on is that while those processes are going to take a bit of time, more than any of us would like, we're not standing still, for example, in amending the initiatives we talked about, the project review proposals and the recommendations that are being made in the NCI report.

For example, Mr. Baker and his team have already adopted those review cycles. So we're putting those in place as we go. Not waiting for other reviews to take place on the things that we can, in fact, do, and we are proceeding.

We are proceeding at a good pace on many of the programs where we know we can and have folks in Russia this day working with some of the Navy programs. So we proceed at a good pace on those programs.

Senator ROBERTS. General, according to the GAO and I think it is common knowledge, that any continued progress in reducing the risk of theft in regards to the nuclear material in Russia certainly depends on our gaining access to the Russian sites. What is the status of the department's effort to gain access to these sites?

General GORDON. We've had some problems in the military side of MinAtom, and that's where we're attacking the problem now. We have had pending agreements with the Russians that are being negotiated and working ad hoc as we speak. It has been very difficult. We remain hopeful. But it has been difficult.

Senator ROBERTS. The GAO found that most of the systems, as installed by you, are reducing the risk of theft. That is, I think, obvious. But we seem to be lacking a mechanism to monitor the effectiveness of the systems on a long-term basis. This may be a bit premature in regards to what we were talking about earlier, but what is DOE doing to implement their recommendation to develop a monitoring mechanism with the Russians? I emphasize the importance of establishing such a system.

General GORDON. Just an example of trying to get some technology to work for us is trying to use some of the ideas that have been developed by ourselves and by the International Atomic Energy Agency to look at remote monitoring of sites.

For example, using certain controlled video systems that would give us a report back that, in fact, systems are working, and guards are present, we've had at least the initial discussions, and I'm told by my colleagues that the Russians we are dealing with find this a fairly attractive program.

We may be able to do that truly jointly on this one because they would like to do it themselves. But the short answer, Mr. Chairman, is that we are trying to put some technology to work for us in these areas. We fundamentally know how to do it as long as we can secure appropriate Russian agreement.

I do take this idea of the sustainability of these programs very seriously. It's just not going to work if we go install the stuff, it breaks, and we walk away from it. That's absolutely critical to making this whole program work.

Senator ROBERTS. One of the things that is obvious is the attempt to enable the Russians, help the Russians consolidate their material into fewer buildings, and then convert that material into forms that cannot be used in any weapon. By consolidation, the hope was we might end up spending less money and the Russians more.

But it is my understanding that MinAtom has yet to tell DOE which sites and which buildings would be consolidated. Can you give us an update on that as to which sites and buildings would be consolidated?

General GORDON. There are efforts being made in that regard right now by Mr. Gerard. But I would like to give you a more considered current answer for the record, Mr. Chairman, give you the most current.

DEPARTMENT OF ENERGY,
NATIONAL NUCLEAR SECURITY ADMINISTRATION,
OFFICE OF THE ADMINISTRATOR,
Washington, DC, May 18, 2001.

Hon. PAT ROBERTS,
U.S. Senate,
Washington, DC.

DEAR SENATOR ROBERTS: It was a pleasure to testify before the Senate Armed Services Committee's Emerging Threats and Capabilities Subcommittee on May 15, 2001. At that time, I took two questions for the record from you. In response to your request for more detailed information about how the fiscal year 2001 funding to the Fresenius project will be used, documentation from the Lawrence Livermore National] Laboratory on the project indicates that the $3M of Initiatives for Proliferation Prevention (IPP) funding will be used to provide facility improvements and basic process equipment that will be used in the dialysis joint venture. Fresenius, as part of its contribution, will provide the actual process/assembly line equipment.

The improvements and basic equipment needed by the joint venture are such things as water, heating, sanitary, and telecommunications systems, testing systems, autoclaves, a quality control laboratory, air-handling systems, sterile steam, chilled water, cooling systems, electrical power distribution, upgraded fire protection, storage and mixing tanks, material storage, and material receiving functions. These are all part of the infrastructure upgrades needed in the Avangard facility for the dialysis project, which will be funded in fiscal year 2001.

In response to your request for an update on site and building consolidation: the Department of Energy (DOE)I National Nuclear Security Administration (NNSA) has witnessed successful closure of 21 buildings located at several Russian sites and has converted more than 2 metric tons of high-enriched uranium (HEU) to low-enriched uranium (LEU). The Russian Ministry of Atomic Energy (MinAtom) has proposed an aggressive plan calling for the closure of 60 buildings through material consolidation and conversion of an additional 27 metric tons of excess weapons-usable HEU over the next ten years. According to MinAtom, specific details such as the name and location of the buildings planned for closure will become available once DOE/NNSA and MinAtom are engaged in negotiations on a bi-lateral material consolidation and conversion (MCC) agreement. The DOE/NNSA is prepared to table a draft Agreement as soon as it receives interagency approval to proceed.

If you should have any additional questions please feel free to contact me or have your staff contact Laurie Harrison at (202) 586–7369.

Sincerely,

JOHN GORDON.

Senator ROBERTS. All right. It took 2 years for DOE to develop the NCI program with guidelines that cover such basic management issues as project selection review and approval procedures. Some of us feel that time period—well, that that should have been done from the outset. Any comments?

General GORDON. I think I would agree with you, sir. Again, what we've done in response to these issues, even on that particular one and some of the accounting programs, it's my understanding that the NNSA was responsive to the GAO even in the initial parts of their investigation and began to correct that in real time again as opposed to waiting for the their full reports to come out.

But I must simply agree with you, Mr. Chairman, that if there are shortfalls in projects—if projects were not fully thought out at the time and if controls were not in place, we need not let that happen again.

Senator ROBERTS. Where are you in encouraging the Russians in regards to cost-sharing?

General GORDON. That's a continuing discussion with us in everything we do, and I think in most of these areas they have put up at least in kind in all of these projects. So it's on our list for every program we work, sir.

Senator ROBERTS. One of the suggestions has been, and we looked into this in the last session of Congress and we are probably looking at it again very seriously in regards to how the NCI program differs from the IPP program; why there was a need to create a separate management structure to implement both? What are the differences in these programs? There has been a suggestion by the GAO that perhaps these programs could be merged and better managed. How do you feel about that?

General GORDON. As I suggest in my statement, we're going to take a hard look at that as to how to proceed in that area. There are differences in the two programs, at least in how they were initially conceived, and they're thought of now.

Senator ROBERTS. But the basic goal is the same?

General GORDON. But the goal of the NCI program, the way we now talk about it, is to reduce the floor space, reduce the plants, and reduce the operation of the facilities to where the employment and other issues are by-products of that that naturally occur; where as, the IPP is a little bit more focused on employment itself and employment opportunities and commercial opportunities.

But, as I said, Mr. Chairman, we do intend to take a serious look at that. Again, they operate a little bit differently. The IPP does operate in some of these cities. They operate in many other locations as well. They do not operate under a government-to-government agreement now.

Again, just to repeat, we will take a very serious look at combining these programs and finding out whether we should combine the best of the two into one. Whether IPP should become NCI or NCI should become IPP or whatever the combinations are, that has yet to be determined. But we're taking that on as a considered look, sir.

Senator ROBERTS. This is a cooperative program between the United States and the Russians. Now you have a pretty good feel and a lot of past history in dealing with the Russians. I do not think there is any question that the Russians are dissatisfied in some respects with both programs, more particularly NCI. What are their concerns and are they justified?

General GORDON. I think some of the concerns are, as you pointed out and as Ms. Jones pointed out in her statement, the program has been off to a slow start, and there hasn't been a lot of money flowing into the program.

On the other hand, some Russians have looked at it differently than others. The MinAtom, as itself, is essentially a controlled organization, and they would like to have the money up front and run their programs. What we believe we should do is operate inside the cities, which gives a totally different view and perspective on the program, and operate at some of the smaller levels that can build infrastructure and can build perspectives on business and economics that are not likely to come from MinAtom themselves.

Senator ROBERTS. Let's get specific and bear with me here. MinAtom has sent DOE letters in the past year that have pointed out that Russia has only received $3 million out of the entire amount allocated. In the most recent letter sent last week, MinAtom states that they believe, “there are other reasons impeding the implementation of the NCI agreement.”

I continue, “the most fundamental of those are the unsatisfactory funding for the agreed project’s ineffective use of the allocated budget funds.”

They go further by stating, “we continue receiving quite a large number of requests for access to the closed cities. Such visits require significant funds to finance business trips, drawing resources from the project financing in the nuclear cities.”

“However, mere visits to the closed cities cannot obviously resolve the issues related to a job creation in the nuclear cities.”

How do you plan to respond to them in regards to these concerns?

General GORDON. Mr. Chairman, the requirements—commitments that Congress has levied and that we’ve accepted obviously, first off, to spend no less than 51 percent of the money in Russia, will be accomplished, and our goal is actually to begin spending numbers on the order of 65 percent on the projects, if at all possible, and I expect to be able to do that.

I think the numbers, some of their own accounting and, again, I don’t want to quibble over the amount too much because I certainly agree that the largest percentage of funds were not spent in Russia at the outset, but the balance is probably twice that because I don’t think they count some of the work that has been done with the European bank and some of those other programs.

But, again, Mr. Chairman, we need to spend more money in Russia, if we’re going to do this program, and we need to spend it there.

With respect to access as a whole, I don’t know if there has been too much request for access in the past or not, but, again, I don’t think we’re going to be able to sustain these programs, and I don’t think the business partners are going to play on them very hard if we don’t have the degree of access needed. Again, we’re in the middle of the discussions for the second or third or forth time, with the Russians right now.

Senator ROBERTS. Let me—and I’m going to cease and desist here so I can turn it over to Senator Landrieu and to Senator Allard, but this sort of gets to your feeling in regards to what the Russians have said and what they will do or may not do.

I think you are certainly aware last year’s subcommittee established legislation that required the MPC&A program to establish an access policy with MinAtom and required the NCI to obtain a written agreement. Let me emphasize the words “written agreement.” Not intent, but “written agreement” with respect to closure of some of its nuclear weapons assembly and disassembly facilities.

Now, some may question that as to where we were so specific, and we had to be specific. But in dealing with this program, obviously you want to be as open and positive and have common sense, if I can use that term, with the Russians as possible.

But we have a coequal in this business. It is called the House of Representatives. When we went to conference, it was very clear that they would not agree to continue funding unless we obtained a written agreement. You and I have talked about this a little bit in terms of Russian intent. Could you shed a little light?

It seems to me, we may have to maybe come up with some out-of-the-box thinking or some art craft here. I do not think they are objecting to the transparency or the access. But I do think in regards to the written agreement that may pose some problems, and yet we think the program certainly merits further consideration. Any comment?

General GORDON. Mr. Chairman, I don't know quite how to go with this, but I will say we have received from the Deputy Minister, Mr. Ryabev, what I think would be fair to call a commitment on his part and his agency's to begin the efforts to close out these facilities on Avangard. It's his document that's signed, and it's written to us. I guess the issue is whether that constitutes agreement or not.

He's also on record, and we just came across it on a speech that Mr. Ryabev gave within the last couple of days to the Duma stating the very clear intent of MinAtom, talking to their own legislative body about their intent to close these facilities.

So we have that record. They're speaking to themselves, this is openly available. We have a letter from Mr. Ryabev toward this point. I guess at issue is whether that satisfies the term "agreement" or not.

I would also tell you we have gone back to Mr. Ryabev in real time, if there's anything that looks more like a formal agreement, it's possible that may prove different. I understand their perspective.

I think, for the reasons that we've discussed and Senator Landrieu has discussed, that if there is a way creatively to release those funds towards that end, that would be a benefit towards many of the programs we're trying to do.

In particular, where we are now kind of on a cusp with this dialysis company, they're ready to go. We think the Russians are ready to go. There's $3 or $4 million standing in the way of being able to do that.

I don't want to stand it up as one of the only things, but this will be a measure of whether this program is going to be able to make it or not. If we get a real program in there with this kind of magnitude with potential to really take over a significant portion of this material, the jobs, the work, and the economic benefit that comes from that, it offers at least a signal to the other companies that are interested that they may actually be able to work in this environment.

Conversely, if it falls apart, it probably sends a signal back to business partners equally.

Senator ROBERTS. I concur with that statement.

Senator Landrieu.

Senator LANDRIEU. I have an interest in looking to see how we can actually work through this because I think this particular program is at a critical juncture here. I thank you, General, in your work and want to try to be helpful in making whatever changes are necessary to the program. But overall ensuring that the funding is there to move ahead with something that I consider and I think the chairman does and others a real threat—security risk to the United States.

Again, to reiterate what I said in my opening statement, this is fundamentally a security issue for us.

I really appreciate your help and support and want to submit for the record the letter that you referenced which I have a copy of here, Mr. Chairman, that may or may not be considered by some as a signed agreement. But it is very specific in what it says in terms of being ready to close this facility.

There are 3,000 to 3,500 jobs at stake at this particular site. So I would like to just submit that to the record.

Senator ROBERTS. Without objection.

[The information referred to follows:]

Translated by: Alexei Vladimirsky, DOE-M, ext.5886

RUSSIAN FEDERATION MINISTRY ON ATOMIC ENERGY

109180, Moscow
Staromonetny 26

Phone: 233-1718
Fax: 230-2420

March 20, 2001

Ref # B/779

To: Mr.K.Baker,
Deputy Administrator for Defense Nuclear Nonproliferation,
U.S.Department of Energy

Dear Mr. Baker

In response to your information on the possibility to render financial help to the RF Minatom to convert the Electromechanical Plant "Avangard" in Sarov to civil production, I have to inform you of the following.

RF Minatom intends to stop all nuclear warhead activities at this plant and convert it for civil production. Under these circumstances all nuclear arms assembly works have been fully discontinued and all disassembly works are supposed to be terminated in 2001. The Ministry has been bearing large expenses related to the conversion of the plant to civil production, which include:

- Manufacturing containers for packaging and transportation of the nuclear materials;
- Removal of such nuclear materials to special vaults;
- Disassembly of specialized equipment;
- Decontamination of the premises;
- Implementation of security procedures (such as perimeter fence movement, etc.).

At the present time the expenses for the implementation of the above measures have already reached 500 M rubles[1] and still keep increasing.

In addition, it is necessary to undertake enormous efforts and find considerable funds to ensure jobs for 3,000-3,500 specialists presently employed at the plant in the civil sector of economy with the wages corresponding to their skills and experience. Moreover, in the framework of converting the plant to civil production, the premises are being redesigned and refurbished and the personnel retrained.

According to our preliminary estimates, no less than $ 50 M is needed for these goals.

First Deputy Minister **L.D.Ryabev (signed).**

[1] 500 M rubles ≈ 17,2 M USD (at the exchange rate of 29 R = 1 USD) [Alexei Vladimirsky].

Senator LANDRIEU. I also want to submit my other questions for the record. I have some for open and some for the closed meeting. Just to take my limited time before Senator Allard speaks to say how important I think it is to get this funding in a timely manner.

Because if we do not, it is not going to be there when we go to ask for it. This program in the budget has been cut substantially, it has been recommended for cuts. The way things are moving around here pretty quickly that if we don't get this money either redirected, the money that's there released and then for next year that no matter how much we fix it and no matter how many private partners we may have, we are not going to have the funding to carry this out.

I think it will be a real step backwards for the security of our nation. I just want to be on the record saying that. Our whole side, according, Mr. Chairman, to our Ranking Member, Senator Levin, is very concerned about this. I wanted to express this at this hearing and commit these for the record. Thank you.

Senator ROBERTS. We had a good conversation yesterday with Senator Levin on the Senate floor, and his position is precisely that as described by the distinguished Senator.

Senator Allard.

Senator ALLARD. Thank you, Mr. Chairman. The GAO identified duplication of effort between the Nuclear Cities Initiative and the Initiative for Proliferation and Prevention. In the nuclear cities of Sarov, Snezhinsk, whatever, and——

Senator ROBERTS. They have an allergy pill for that if you want to take it. [Laughter].

Senator ALLARD. Apparently there's some other programs and you've reported those, Ms. Jones. Did GAO examine any of these programs for duplication and the possibility of consulting them? I think one of them that comes to light is the State Department's International Science and Technology Center Program.

Ms. JONES. We have recently looked at that ISTC program, Senator Allard, but just from the standpoint of looking at the process that the program uses to select projects and also the process that the program uses to oversee how the science centers are functioning. So we did not look at it from the standpoint of duplication with IPP or NCI.

Senator ALLARD. Does that possibility exist?

Ms. JONES. Yes, sir, it does. Certainly they're going at the same kind of bottom line goal which is to keep weapon scientists, also scientists that work on chemical and biological projects working. They do it from a different standpoint. They basically look at contract research. They're not looking for sustainable jobs in the same way that the IPP program is looking.

But, again, we certainly could look at that to see if there is potential duplication and a way to consolidate all of those kinds of nonproliferation activities.

Senator ALLARD. I think that would be helpful. I hope at some point in time that we can.

Now, on the Department of Energy's efforts, one of the issues raised again by the GAO report, General Gordon, is whether the department should be involved in the area of business development. They indicated in their report that there is some question as to how successful your business development efforts would be.

I do believe the scientists at DOE are some of the best and the brightest in the technical areas, but I'm not so sure about their business acumen.

GAO has noted the successful commercial venture in Sarov was done without U.S. Government assistance. The report noted that the company representative believed that linking the research and analytical skills of the Russian scientists with western companies would be more successful in attempting to start up new ventures.

I wonder if you would comment on the role at DOE in the area of nonproliferation security sites and issues and what experience does DOE have in creating business from scratch?

General GORDON. Senator, I think that the programs are basically evolving to the way you've just suggested and described it there.

What we're doing with the NCI program now and its proposal for this dialysis company is helping provide the basis for them, for the company itself to come in and be able to conduct the work in that location. We're trying to provide basically government agreements, some seed money that would help move in that direction.

The whole strength, Senator, of the IPP part of the program is exactly that. It's helping match up the technical side on both sides with the business folks on both sides. Through IPP we're literally putting—looking through the economic endeavors by facilitating contact by American businesses. So their point is well-taken and well-understood, sir.

Senator ALLARD. On the European Nuclear Cities Initiative, there's a perception there that the Europeans are less willing to get in—consider the scientist as a possibility of serious threat. They're more focused on actual weapons themselves.

Why do we perceive scientists as a threat and many of our European allies do not?

General GORDON. I wouldn't propose to know why they don't, but the knowledge of how to do some of this stuff is just so important, and I think the more we can control, the more that we can keep this expertise, from marketing this expertise into other channels is to our net benefit.

Senator ALLARD. The follow-up question, what kind of effort has our European allies done in trying to deal with the security of the material?

General GORDON. I would like to give you an answer for the record on that, Senator. I don't have one. I don't have an answer on the top of my head. Let me give you a for-the-record answer.

[The information referred to follows:]

DEPARTMENT OF ENERGY,
NATIONAL NUCLEAR SECURITY ADMINISTRATION,
Washington, DC, May 18, 2001.

The Hon. WAYNE ALLARD,
United States Senate,
Washington, DC.

DEAR SENATOR ALLARD: It was a pleasure to testify before the Senate Armed Services Committee's Emerging Threats and Capabilities Subcommittee Hearing on May 15, 2001. At that time, I took a question that you posed "for the record." I would like to provide you with the following information concerning the level of support our European allies have provided in securing Russian nuclear material.

Although the U.S. has provided the majority of assistance to Russia in securing nuclear material, our European allies have made several key contributions.

- European Union (EU) organizations such as the Joint Research Center (JRC) and the Euratom Safeguards Office (ESO) have worked jointly with the Russian Federation (RF) in the areas of training, analytical capabilities, and reference materials.
- Germany and the United Kingdom have provided Material Protection, Control, and Accounting (MPC&A) assistance at Mayak facilities such as the Isotope Production Reactor Plant and the Isotope Production Plant, and at the RT–1 Fuel Reprocessing Plant. These efforts have been conducted with the knowledge of the U.S. MPC&A team but totally independent of U.S. funded MPC&A activities.
- The JRC is supporting the establishment of a model plutonium storage facility laboratory at the All Russian Scientific Research Institute of Technical Physics (VNIITF) located in Snezhinsk for the purpose of developing the instrumentation that would be used in such a facility.
- European Safeguards Directorate (ESD) has purchased over $1M of MPC&A equipment for Gosatomnadzor (GAN) to use at power reactors and fuel fabrication facilities. This includes tamper indicating devices (TID) and video surveillance systems which are used by GAN for all Russian nuclear facilities.
- The German firm, Gesellschaft fur Anlagen and Reaktorsicherheit (GRS), provided consulting services and equipment to improve the site perimeter and building security systems at Bochvar Institute.
- Kurchatov Institute in Moscow has worked with the German government on physical protection upgrades.
- The Murmansk Shipping Company in Murmansk is working with the British and Norwegian governments on physical protection upgrades and has cooperated with the Swedish government on a material accounting system.

If you should have any additional questions please feel free to contact me or have your staff contact Ms. Laurie Harrison at (202) 586–7369.

Sincerely,

JOHN GORDON.

Senator ALLARD. General Gordon, would you talk a little bit about your new guidelines and measurements? GAO noted it took 2 years to develop and implement the new procedures for the Nuclear Cities Initiative. I guess the question that comes up is why did you take that long or why was that length of time required?

Also DOE, and apparently you've concurred with the recommendations of the report, but how long will it take to implement those recommendations?

General GORDON. I expect to move pretty quickly on those. For example, the concept—I don't know the question to the answer why it took so long, I really don't. But, for example, the issue about the recommendation, we have a better program review and acceptance procedure that involved a multiple process of making sure, for example, economic viability. We have, in fact, already begun to implement that.

The same individual that developed those procedures for the IPP program is implementing them now on the Nuclear Cities Initiative. So we're not letting any grass grow under our feet on these initiatives, sir.

Senator ALLARD. Thank you, Mr. Chairman.

Senator ROBERTS. General Gordon, there is a great deal of support in Congress for the project that we were just talking about, the dialysis project; there is a great deal of support for additional funds.

Senator Landrieu just spoke about that, and I believe that the request is around $3 to $4 million. I think, if I am accurate, that the suggestion has been made that at least some of that money could be transferred from the IPP program.

But it is my understanding that, I know the IPP program has specific criteria that perhaps—that this program could not meet or at least that is my understanding of it.

Can you agree, this is sort of a crossroads project here? Can you tell me what specifically that money would be used for in regards to this project? Or maybe you would like to get back to me on that?

General GORDON. I could either give you an answer for the record or ask Mr. Baker to comment.

Senator ROBERTS. If you could comment and then do both. Senator Levin is very supportive of this. I am supportive of it. I think with the budget numbers and the request we have, it is important that we know what that would be used for.

General GORDON. Let me say at the outset that our understanding is exactly that, that there's about $4 or $4½ million as the total amount. There is an initial thought that about $3 million of that could come from IPP. But the requirements and limitations on that funding make it, in fact, not available. Mr. Baker.

STATEMENT OF KENNETH BAKER, ACTING DEPUTY ADMINISTRATOR FOR NONPROLIFERATION AND NATIONAL SECURITY

Mr. BAKER. I'm Kenneth Baker, Acting Deputy Administrator for Defense Nuclear Nonproliferation. Sir, we tried to work this out when Secretary Richardson was still the Secretary of Energy at that time. To finish the Kidney Dialysis Project, it would cost us $4½ million. We did not have that money in the NCI program.

A decision was made by the past Director of Nonproliferation and National Security to use $1½ million of NCI money, which we had; and $3 million of IPP money to push this over the goal line to get this Fresenius project done and put it in the Technical Park.

We found out after I looked at this when I took over Acting Director that there were rules and regulations for IPP that we could not meet while trying to use IPP money.

The first one is the benefit to American firms. The $5–$6 million that was provided to Livermore, who was the project manager on this particular project, could not be spent until certain IPP project requirements were met.

The $3 million would push it over, but right now we're trying to work out how IPP can finish this off. That was the problem, sir.

Senator ROBERTS. You have defined the problem, but you have not told me what you are going to spend it on specifically.

Mr. BAKER. The money is for seed money, seed money to go put Fresenius into the Technical Park to get it going, to get it up and running. This was the money that was promised for the seed money, and they would take it over completely after that. That's what the money was used for, to get ground money to get them going in the Technical Park.

Ms. JONES. Mr. Chairman, if I could raise a question on that or add a point.

Senator ROBERTS. Yes, please.

Ms. JONES. During the course of our work, the NCI program has provided $1.5 million for this project already. During the course of our work, we were told that it had only been spent several hundred thousand dollars. So seed money has already been provided to this project. So it's a little unclear what the additional $3 million would be for, based on the work that we've done.

Senator ROBERTS. It's very important, and I am going to have a comment a little bit later as I get to the second sheet here of the GAO report where 70 percent of the NCI fund is spent in the United States, 30 percent spent in Russia. It may not be a proper question or maybe I do not understand it correctly, but if it were $3 million and we still have that ratio, we were not there yet for the seed money. There aren't going to be that many seeds.

General GORDON. I think the intent is to spend nearly all or all of it there, sir.

Senator ROBERTS. So that $3 to $4 million would be spent entirely by the seed money or for the seed money to score the touchdown or——

General GORDON. It's my understanding.

Senator ROBERTS. There are a lot of us who feel this is very important, and I do not want this to—I understand the IPP criteria, but I also understand that—we need to know exactly what this money is going for. I appreciate the term seed money, but I wonder what that means.

General GORDON. It includes getting the facility up and running, getting the water supply up and running, the power source that would make it go. It's establishing that core infrastructure.

Senator ROBERTS. I am an event-oriented guy. If you can spell that out to me like, "OK, Roberts, I am going to turn the water on." That makes sense. If you say seed money, who knows how many grants we have running around on seed money. All right, enough of that.

General GORDON. Water, electricity, doors, walls.

Senator ROBERTS. That makes sense.

I have to ask, OK, you know what's coming. If there was a boy named Sue, we have a girl named Gary. I should not do this, I apologize. Do you want to make any comment about that?

Ms. JONES. All I can say is I can give you my mother's phone number. She liked the name and I was the first. I have three brothers. I'm the only girl.

Senator ROBERTS. Bless your heart. I apologize for that. I will catch heck for that from staff.

Ms. JONES. No problem, Senator. I've been getting the question all my life.

Senator ROBERTS. My name is Pat Roberts, my first name is Charles, and you can call me Chuck if it bothers you.

OK. Let me ask a couple of questions in regards to your work. Your review found that the department is installing systems that reduce the risk of theft in Russia. Can you give me any comments for the basis of your findings?

Ms. JONES. Yes, Mr. Chairman. Our findings were based on reviews conducted by a DOE technical survey team as well as visits to nine sites in Russia. The technical survey team is a group of experts that DOE has put together to look at these projects and how they were installed to make sure they were following the criteria that DOE has set out for success.

During the course of our review, we looked at the reports they did on 30 sites. This technical survey team found that 22 had been installed correctly and reduced the risk of theft.

Also we saw a lot of things on the site visits we did to nine different sites. We saw such things as video cameras being installed. We saw hardend doors and locks, things that hadn't been used before. We felt it was comfortable for us to draw the conclusion that what DOE was doing was reducing the risk of threat to nuclear material.

Senator ROBERTS. I don't want to speak for every member of the subcommittee, but I think in terms of priorities we were very insistent that that would be one of the priority goals. So I am very pleased at your observation.

I asked General Gordon about the Russian view. Of course it depends on the Russian, I suppose, that is there today. The posthumous period. But their view of the NCI program, in your view, what did they like and what did they not like about it? It is a cooperative program.

Ms. JONES. Yes, sir, the officials that we talked to, and we talked with MinAtom officials, we talked to officials in Sarov both at the weapons institute as well as the open computing center and the deputy mayor of the city. These officials provided a consistent view when it came to the fact that they're serious about downsizing the weapons complex. They also believe there is a role for the U.S. Government to help them do that.

The MinAtom officials we talked to were very disappointed and dissatisfied with the level of assistance they were getting under the program. They also believed it did have limited success in terms of the numbers of sustainable jobs that had been provided.

They also felt that lack of success was increasing the skepticism that others in Russia had that this program was really just there to get the U.S. in the door to get information on their weapon activities.

Officials in Sarov were very grateful for the program, but they were also a little dissatisfied with how it had been implemented. They expressed some displeasure with the European bank project because they felt that the funds that had been given out through loans under the bank really weren't focused on jobs for the weapons scientists. They were small loans. They weren't starting new businesses, they were really focused on the retail establishments. So they didn't really feel that was getting at the goal of employing weapon scientists.

Senator ROBERTS. When, in fact, if I can read my writing when I was taking notes in regards to your summary here, that was in fact the primary goal with regards to weapon scientists. There may be other programs that are social and economic in nature that would improve the environment of a community, but basically the goal was in regards to the weapon scientists; is that not correct?

Ms. JONES. That's correct. While the community development projects are, on their face, good projects, they really didn't contribute to getting jobs for the weapons scientists.

Senator ROBERTS. You talked to a lot of industry officials in regards to your study. Give me a take on their attitude about any impediments that they found in regards to commercial investment in the nuclear cities. I am not talking about the NCI program or the IPP program, but their investment.

Ms. JONES. Sure. The industry officials we talked to really painted a very cautious picture about investing in Russia as a whole, in particular the nuclear cities. They told us that Russia really doesn't present a business-friendly environment because it lacks a market economy.

Also its legal, financial, and banking systems provide for an uncertain investment climate as well as the uncertainty in terms of political stability.

When looking at the nuclear cities, they found that the weapons scientists didn't really have a good business sense or marketing backgrounds. Of course, the point that all of us have been making about access to the cities is very limited. So those were the negative aspects.

From a positive standpoint, they felt that they were very optimistic about a very talented pool of scientists, mathematicians, and engineers that they could tap in the future for their business ventures.

The point that they tried to make to us is that industry must play to the strengths of the weapons scientists in trying to develop commercial opportunities in Russia.

Senator ROBERTS. Let me get to a question that we have been mulling over for some time now. The NCI program and IPP program. You mentioned in your conclusion that perhaps they should be consolidated. Are these programs sufficiently different to warrant their continued separation, or I could put it the other way. Are they different to the extent the consolidation is not the way we want to go? What's your take on that?

Ms. JONES. I appreciate the fact that General Gordon said DOE is going to consider and look at consolidating these two programs. What we saw is they have the same basic underlying goal of trying to create jobs for weapons scientists.

We also saw that there are so many things happening in parallel. For example, they both have very similar review procedures. IPP had very much started to tap industry to help them figure out what commercial projects are working. NCI is just now starting to do that. So they could be working together on a lot of these avenues that they haven't been in the past.

Also, we found that there were some similar projects, projects started in IPP and ended up in NCI. Projects were proposed to be funded by both programs, so we thought it would make more sense to consolidate the two, have some flexibility to cover the kinds of things that the NCI program has been focusing on that might be different from IPP, such as business development, education for scientists. That might become a more efficient program as a whole.

Senator ROBERTS. You touched on the status of the European Nuclear Cities Initiative and a European consortium. I think you said 15 nations; is that correct?

Ms. JONES. Yes, it's actually the European Union. The European Commission is the arm of the Union that provides this kind of money.

Senator ROBERTS. So it is a commission out of the European Union not a consortium?

Ms. JONES. Yes, sir.

Senator ROBERTS. OK, my mistake. It is 15 nations?

Ms. JONES. Yes, sir.

Senator ROBERTS. The EU is into every other thing, they might as well be into this. Pardon my editorial comment.

You also indicated that it was Italy that was taking the lead, and that they are making more efforts to cooperate vis-a-vis Russia; is that correct?

Ms. JONES. Yes, sir, that's correct.

Senator ROBERTS. I asked you the question, as I recall, why? You indicated that they wanted to tap the resources of these scientists to be a specific help as opposed to a more generic kind of program. Am I on line there with what you told us?

Ms. JONES. Yes, sir. In our conversations with the Italians, they're interested in focusing the efforts with the Russians on things like energy efficiency and cleanup of nuclear waste. They felt they would, rather than try to create sustainable businesses, contract with weapons scientists and use their expertise to help develop technologies and different things in those two arenas.

Senator ROBERTS. Within the European Union?

Ms. JONES. Yes, sir.

Senator ROBERTS. Does that make sense to you?

Ms. JONES. I think it does. I think what they're trying to do is say that we in the European Union, we in Italy have a need for some help in trying to develop technologies for cleanup, for energy efficiency. You have scientists that have backgrounds, mathematicians, engineers, and they want to tap that expertise in this particular arena.

Senator ROBERTS. Interesting—I will get myself in trouble if I say that our programs tend to be somewhat patronizing. But it seems to me that maybe they are on to something here in terms of the approach. You get immediate employment, you are making a difference with exactly the kinds of things that you have expertise with. I am not trying to make a judgment here. Staff, don't go nuts now in terms of what is going on.

Have they dedicated any funds to this? Where are they with this?

Ms. JONES. This is really just a proposal that's in the discussion stage right now. We're told they would like to come up with $50 million to spend over the next few years, but it's really just a proposal at this point, Senator.

Senator ROBERTS. They'd better fund ESDI first if they think they can do that, with all due respect.

Seventy percent of NCI funds spent in the United States, 30 percent spent in Russia as of December 2000. The majority of U.S. expenditures by national labs, three-fourths of lab expenditures for salaries and overhead, Russian officials very dissatisfied with the split of funding. I certainly would be as well.

The DOE was directed by the energy appropriations folks to fund 51 percent. You want to comment on that? More especially with the example the Savannah River Site, and they move their overhead costs from 37 percent to 11 percent.

Ms. JONES. Yes, sir.

Senator ROBERTS. Can't we get 70 percent of the funds? I wrote down here somebody said Russia thinks the United States has set up the program and is stealing the money. That is a little harsh, to say the least. We have to do better than this.

Ms. JONES. During the course of our work in talking with the Savannah River Site officials about the program, they had changed their overhead fee from, as you said, 37 percent down to 11 percent.

So we were hopeful that the Savannah River Site approach might be a model for the rest of the sites in the program. I know in talking with General Gordon about this, he's talking about his commitment to looking at this program from a management overview, and I would hope that the overhead would be something that they would be looking at.

Senator ROBERTS. We had some discussion in regards to overhead costs. I am not going to take up the subcommittee's time to get into that to the extent that I wanted to, but I still need to be educated. We are going to be back in touch with you to see. I think you had, what, 27 projects?

Ms. JONES. 25, 26, yes, that ballpark.

Senator ROBERTS. Then I was asking questions about what do those overhead costs entail? Then we got into that to some degree, but I am very concerned about that, and I think the subcommittee is as well.

We were going to try to have the NCI project target approximately 30,000 to 50,000 people over there; is that correct?

Ms. JONES. What the Russians are saying is that they need to find jobs for weapons scientists. 30,000 to 50,000 jobs over the next several years. That's what they're looking for. Not necessarily that the U.S. has to find that number of jobs.

Senator ROBERTS. Let me tell you what we hit during conference in regards to last year when we had the request for additional funds and to do a better job. It was tossed right back that the projects were employing about 374 people.

Well, 400 people out of 40,000 doesn't quite cut it. In regards to any kind of progress. I am not trying to perjure this program, I am just saying what I have in terms of that our funding discussion. We had what I would call meaningful dialogue.

In addition, they said that scientists still receive salaries from the institute while working on NCI-related activities, and you have that in your summary. One half of the projects are not designed to create jobs.

Now, some of these things in terms of a drug program, child care program, environmental programs certainly could be justified as to their own worth. But that was not the goal or the original goal, as I understand it, with regards to employment of the weapons scientists; is that correct?

Ms. JONES. That's correct. Our point, Senator, is when you have limited funds, are these the types of activities you want to focus on to try to get these jobs?

Senator ROBERTS. You gave the example of a private company, after a considerable number of years, was able to or is able right now to pay 100 of the weapon scientists approximately three times the pay that they would receive under NCI/IPP. They are involved in software development. Could you amplify on that?

Ms. JONES. Yes, sir. This is a company where one of the officials of the company did have some ties to Russian officials, and they worked through those ties to get into Sarov. They now are employing 100 individuals who were former employees of the weapons institute in Sarov.

As you said, these individuals are making three times the salary, and they have cut their ties with the institute, unlike some of the NCI projects where they're still part time.

So it did take them 7 years to do it.

Senator ROBERTS. But it is successful?

Ms. JONES. Yes, sir.

Senator ROBERTS. You visited that office or that building?

Ms. JONES. Yes, we did. That's actually in the same building as the open computing center which is one of the NCI projects. They're on different floors. We were given a tour and talked with some of the scientists. They seemed all very busy and interested in what they were doing.

Senator ROBERTS. Was this the program where you indicated there was an age difference in regards to the weapons scientists, or am I suffering my standard memory lapse?

Ms. JONES. I think we raised that issue in regards to the European program that they are going to be targeting older weapons scientists. They felt that some of the younger scientists might have more flexibility in terms of future careers.

Senator ROBERTS. What was the difference, if any? You say that the private company is on floor "X" and the NCI project is on floor "Y"; is that correct?

Ms. JONES. That's correct.

Senator ROBERTS. You visited both?

Ms. JONES. Yes, sir.

Senator ROBERTS. Describe what was going on.

Ms. JONES. Our experience at the open computing center was that mainly the scientists followed our team around. There didn't seem to be a lot going on versus when we were in the commercial space, the scientists were all sitting at their computers working away. That was our observation during the visit.

Senator ROBERTS. You had one floor where they are working away not paying any attention to you, with all due respect, then the other looking at the friendly tap on the shoulder judge, if you will, and obviously they were showing you around.

Again, I am not trying to perjure this. I found the same thing with the ISTC program that I had the opportunity to visit and always make that mistake of thinking it was an NCI project, which it wasn't. They were very happy to take you all around and explain why it was not working and why they needed more money. Why it really wasn't cogent to that.

I appreciate that very much. Are other companies into this? Is this a growing kind of program here where private and international companies are able to do this?

Ms. JONES. I think the NCI program is facilitating some of those companies coming into the closed cities.

Senator ROBERTS. They are a catalyst then?

Ms. JONES. They are a catalyst. They are a facilitator, absolutely.

Senator ROBERTS. OK, good.

I have no further questions. I appreciate your patience and thank you for responding.

General Gordon and Ms. Jones, do you have any final comments you think that might be helpful?

General GORDON. We had a good discussion, Senator. You know where we're trying to take this organization, where we're trying to take these programs. We're in broad accord with the recommendations that are being made by GAO, and we're going to head down those directions.

Senator ROBERTS. Tell the folks downtown we need their review at double time. Well, no, just put quick time. We won't go double time.

Ms. Jones, any final comments? Thank you for the job that you have done.

Ms. JONES. Thank you, Senator, I appreciate it. No final comments.

Senator ROBERTS. We will now proceed to the closed session. Thank you.

[The prepared statement of Senator Santorum follows:]

PREPARED STATEMENT BY SENATOR RICK SANTORUM

Chairman Roberts, thank you for scheduling this important subcommittee hearing today. I know that the U.S. Department of Energy's nonproliferation programs have been a key concern of yours. Your focus on the U.S. government's "return on investment" has been particularly helpful for Members of this subcommittee.

I believe Members of the subcommittee would agree that Department of Energy nonproliferation programs such as the Nuclear Cities Initiative (NCI) and Material Protection, Control and Accounting (MPC&A) program are well-intended and are consistent with U.S. national security objectives. That being said, there are legitimate concerns that have been highlighted by the U.S. General Accounting Office (GAO) on the performance of these and other nonproliferation programs. I am hopeful that today's witnesses will be able to discuss the GAO's conclusions and will be able to explore ways to improve on program performance.

With respect to where NCI funds are expended, GAO's data portray a phenomenon that deserves further scrutiny and attention. I am concerned with GAO's conclusion that 70 percent of NCI program funds are spent in the U.S., rather than inside Russia. The GAO's observation that the Department of Energy's inability to obtain access to sensitive sites in Russia is constraining the MPC&A program also bears attention. Lastly, I am concerned with GAO's observation that the Department of Energy does not yet have the means to monitor the security systems it is installing to ensure that they are operating properly over the long-term.

Again, I look forward to the testimony of today's witnesses and to a candid exchange on some of the conclusions reached by the GAO.

[Questions for the record with answers supplied follow:]

QUESTION SUBMITTED BY SENATOR PAT ROBERTS

1. Senator ROBERTS. General Gordon, the GAO report said that DOE is attempting to help Russia consolidate their nuclear material into fewer buildings and convert the material into forms that cannot be used in weapons. By consolidating the material, DOE may end up spending less money to install new security systems.

However, MinAtom has yet to tell DOE which sites and which buildings would be consolidated.

What is the status of DOE's efforts to get MinAtom to identify which sites and buildings will be consolidated under the program?

General GORDON. The NNSA's Civilian and Conversion Division, which includes the Material Consolidation and Conversion (MCC) Project, has already successfully closed 21 buildings and significantly reduced the proliferation risk associated with more than 2 metric tons of very attractive high-enriched uranium (HEU) by converting it to low-enriched uranium (LEU). In addition, MinAtom has proposed an aggressive plan or "roadmap", which calls for the closure of 60 more buildings and the conversion of an additional 27 metric tons of HEU over the next 10 years. According to MinAtom, specific details such as the name and location of the buildings planned for closure will be shared with the U.S. as soon as DOE and MinAtom are engaged in negotiations on a bilateral MCC agreement, which would provide an appropriate "legal framework" for the exchange of such sensitive information. For the last 6 months the U.S. has refused to begin negotiation of a bilateral agreement because of Russian/Iranian nuclear cooperation. DOE is prepared to table a draft agreement, as soon as it receives interagency approval to proceed.

QUESTIONS SUBMITTED BY SENATOR MARY L. LANDRIEU

NUCLEAR CITIES

2. Senator LANDRIEU. General Gordon, my understanding of the fundamental difference between IPP and NCI programs, other than the number of sites and facilities where the programs are engaged, is that IPP directly funds work for the scientists in the closed cities and institutes but NCI is designed to bring economic development.

Is this understanding correct?

General GORDON. NCI is designed to reduce the size of the weapons complex in the Russian nuclear cities. Economic diversification and development is a tool to achieve this goal. NCI removes functions and equipment from the weapons sites within the closed cities; reduces the physical footprint; and seeks to create sustainable, alternative non-weapons work outside of the nuclear institutes and within a functioning city economy.

IPP, on the other hand, is a "brain drain" program that engages former Soviet weapon scientists at institutes across the New Independent States (NIS)—in Belarus, Ukraine and Kazakhstan, as well as in Russia—in applied research projects having high commercial potential. The scientists comprise former biological and chemical weapons researchers and missile development experts in addition to nuclear scientists.

3. Senator LANDRIEU. General Gordon, the GAO has recommended combining IPP and NCI. How could these programs be combined and still preserve the unique aspects of each?

General GORDON. The GAO recommended that the NNSA Administrator "determine whether the two programs should be consolidated into one effort—including a determination of what changes in authorizing legislation would be necessary—with a view toward achieving potential cost savings and other programmatic and administrative efficiencies." NNSA is still in the process of making its determination and we will provide more information as it is available.

4. Senator LANDRIEU. General Gordon, the NCI program has an agreement governing how the Russian government treats programmatic funds for tax and other purposes, the IPP program does not. As a result it works through the State Department sponsored International Science and Technology Center (ISTC) or under the NCI agreement.

How important is this agreement to future efforts, given Congress' concern about not having programmatic funds taxed?

General GORDON. We believe the NCI Government-to-Government Agreement is very important. It provides tax and liability protection, and the structure under which program activities can proceed. Such agreements are very difficult to negotiate and generally take at least a year, and often more, to achieve. In any reorganization involving IPP and NCI, it is important to protect the NCI Agreement, if possible.

5. Senator LANDRIEU. General Gordon, there has been criticism of the NCI program since its inception, nevertheless it does not seem to me to be in our best interest to walk away from the Russian nuclear cities.

Do you agree that it is in our national security interests to continue to work with these cities?

General GORDON. NCI was conceived as a national security program whose aim is to bring the Russian weapons complex more in line with post-Cold War realities, thereby advancing our own security. The Russian weapons complex is vastly oversized, decrepit, and starving for resources on the one hand, and dangerously capable of performing its core functions on the other. We continue to have a strong nonproliferation interest in maintaining our engagement with these cities.

6. Senator LANDRIEU. General Gordon, would you look at the broader objectives of this program and work to develop a program with the focus and flexibility to meet broad objectives?

General GORDON. We agree with the approach. We are currently considering how to best preserve the broad objectives of NCI as we look at the best way to organize this program in the future.

7. Senator LANDRIEU. General Gordon, when Russia announced that it wanted help to reduce the size of its nuclear weapons complex, and shut down two of its four weapons assembly and disassembly facilities, this was viewed as good news. The Russian Ministry of Atomic Energy, MinAtom, took a bold step when it made this announcement. The understanding was that if NNSA is successful in helping to shut down the facility at Avangard then it will proceed with work to shut down the second facility, at Penza-19. The fiscal year 2002 budget request for NCI is $6 million. This level of funding jeopardizes the shutdown of Avangard and will prevent the accelerated shutdown of Penza-19. Because DOE has only one similar facility, the imbalance between U.S. and Russian capabilities has been a concern for many years.

Does it make sense to miss this unique opportunity and long standing U.S. goal to reduce Russian nuclear weapons manufacturing capacity?

General GORDON. The NCI program continues to work with the MinAtom in order to encourage and facilitate the closure of its nuclear weapons assembly facilities. In order to take maximum advantage of the unique opportunities created by NCI's cooperative relationship with MinAtom, and to most effectively utilize the program's funds, NCI will focus its efforts primarily on facilitating the accelerated closure of Avangard, which is the best candidate facility among the four Russian nuclear weapons assembly facilities for accelerated closure.

8. Senator LANDRIEU. General Gordon, if the NCI and IPP programs were combined, how would the statutory provisions that govern each program have to modified?

General GORDON. As part of our response to the GAO recommendation to consider merging the programs, we are currently researching this question, which involves legal and technical issues. We will provide the answer as soon as it is available.

At first glance, however, they could be combined without significant statutory modifications. IPP's statutory limit on funding to the National Laboratories (35 percent) is both workable and consistent with DOE/NNSA's efforts to maximize the nonproliferation impact of program funds. IPP's legislation appears sufficiently broad to permit such additional activities as infrastructure support. There are requirements for projects funded under NCI that are not now part of IPP (e.g., the requirement to commercialize within 3 years). NCI also does not require the same matching requirements from industry as IPP does.

THE LABORATORIES AND THE NONPROLIFERATION PROGRAMS

9. Senator LANDRIEU. General Gordon, it appears to me that there is much confusion, and therefore criticism, about the role of the DOE and NNSA laboratories in the nonproliferation programs including IPP and NCI.

What is the role of the labs in these programs and why are they important?

General GORDON. The primary role of the labs in IPP is to ensure that the technical claims made by NIS institutes have merit and that, in the case of commercialization, the engineering transition from R&D to commercial production follows high and verifiable standards of excellence. The labs provide technical oversight for and conduct joint research with the Russian scientists who participate in IPP projects. In so doing, the labs greatly reduce the technical risks of doing business with NIS institutes. In addition, the labs play a key role in helping to ensure that funds intended for a bona fide commercial project are not diverted from their intended use. The laboratories also have key roles in the project development process, including technical evaluations of project proposals, validation of the weapons-research credentials of Russian scientists, and identification of potential dual-use problems. The laboratories also provide the legal connection with the U.S. private sector, through their cooperative agreement mechanisms, which allocate intellectual property from IPP projects that are commercialized by U.S. industry participants. These expanded non-scientific roles were important in getting the programs under way at a time when only the labs had access to the NIS institutes. These nonscientific roles are gradually transitioning to DOE/NNSA and the U.S. companies involved in commercialization.

Laboratory involvement was also essential to the start-up of NCI, but it is business investment and economic diversification that are the long-term drivers. The laboratories have been significantly involved at the outset of many of NCI's efforts, but their role will diminish over time as business participation increases.

10. Senator LANDRIEU. General Gordon, what do the seven Federal employees do who manage the NCI program?

General GORDON. Up until June 4, 2001, NCI had only four Federal employees. Currently we have five. These employees are: the Director and Deputy Director; a Federal staff member who serves as the desk officer for Sarov and who manages NCI contracts; a Federal staff member who serves as the Zhelezoogorsk desk officer and manages the project review process; and a new Federal staff member who is responsible for generating outside sources of finding for NCI projects.

RESEARCH AND DEVELOPMENT PROGRAMS

11. Senator LANDRIEU. General Gordon, the NNSA research and development program has been effectively reduced $50 million in the fiscal year 2002 budget request from the 2001 appropriated level of $225 million. This is a very large cut and significantly undermines NNSA efforts to address proliferation and detection.

Can you please describe what programs are not being funded and what you would do if you had the funding restored or increased?

General GORDON. As noted in the President's budget request, let me briefly describe the fiscal year 2002 level of funding for the R&D program. The proliferation detection and deterrence program was decreased by a total of $36 million. As a result, in proliferation detection, the remote effluent detection area's hyperspectral activities and much of the lidar activities will be terminated. In deterring proliferation, the reduction will slow the development of new radiation detection materials and nuclear materials analysis techniques. Chemical and biological national security will decrease by $12 million. As a result, the milestones will be stretched out for technology development initiatives involving the development of new chemical and biological detectors, biological foundations understanding, modeling of interior structures, and transfer of decontamination. The decrease will also slow a demonstration project. The nuclear explosion monitoring program will decrease by $5 million. This decrease will defer work such as regional seismic characterization and support to the Air Force Technical Applications Center's advanced regional monitoring system.

If the funds were available at the fiscal year 2001 appropriation level, we would return to the previously described R&D program and development schedule.

If funds were available above the fiscal year 2001 appropriation level, we would anticipate: funding more new sensor concepts for detecting proliferation; expanding our research into detecting shielded fissile materials and detecting fissile materials at greater standoff ranges; expanding our regional seismic characterization and calibration program to match the Air Force Technical Applications Center's accelerated seismic station installation schedule; and making more rapid progress in characterizing a larger number of biological agent signatures.

12. Senator LANDRIEU. General Gordon, the research and development program supports the U.S. effort to address the single greatest threat to U.S. national security interests?

General GORDON. The R&D program is very important to providing the technical underpinning that supports government efforts addressing worldwide threats to national security interests. In fact, our focus on long-range R&D provides operational organizations with innovative systems and technologies to satisfy their nonproliferation mission responsibilities.

13. Senator LANDRIEU. General Gordon, will any other agency have the ability to pick up the shortfall?

General GORDON. Since other agency programs have already defined and submitted their fiscal year 2002 budgets, it will be difficult for another agency to incorporate work we are deferring, particularly because other agencies' priorities are nearer-term and NNSA's focus is longer-term R&D.

14. Senator LANDRIEU. General Gordon, is the NNSA research effort closely coordinated within DOE and with other Federal agencies?

General GORDON. The R&D program is coordinated within the DOE and with other Federal agencies. The R&D program is captured in the overall, integrated DOE National Security R&D Portfolio, and in fact closely leverages DOE investments in Defense Programs and the Office of Science. Coordination with other agencies is primarily documented in the Department of Defense/Intelligence Community/Department of Energy Counterproliferation Program Review Committee Annual Report to Congress and through the Nonproliferation and Arms Control Technology Working Group Report and Symposium, which is jointly chaired by the Departments of Defense, Energy, and State.

15. Senator LANDRIEU. General Gordon, how will the funding cuts in nonproliferation and arms control affect existing programs that advance DOE and U.S. core capabilities in detection and monitoring of the development of weapons of mass destruction?

General GORDON. The requested level of funding will slow the development of new and emerging technologies for detecting and monitoring the development of weapons of mass destruction, particularly detection of emerging proliferation programs.

16. Senator LANDRIEU. General Gordon, what is the role of the DOE laboratories in the national effort to develop technologies to address proliferation risks?

General GORDON. The DOE laboratories, especially the weapons laboratories, have unique, comprehensive understanding of nuclear weapons development, test, and production processes and the technologies needed to assess proliferation activities. In developing the technologies required to address proliferation risks, we are able to leverage current and past investments in the NNSA nuclear weapons program.

17. Senator LANDRIEU. General Gordon, how do the efforts at the DOE laboratories differ from the efforts sponsored by DOD or other Federal agencies involved in this national challenge?

General GORDON. The work we sponsor at the laboratories has a longer-term focus, enabling us to explore higher risk, revolutionary integrated system solutions to the difficult problems associated with proliferation, and we often assist other agencies address their most difficult proliferation questions. Additionally, because of our knowledge of the expertise at the laboratories, we are able to marshal multidisciplinary, inter-laboratory teams to address the significant technical challenges. Other agencies tend to be driven by near-term requirements which lead them to short-term evolutionary development programs.

18. Senator LANDRIEU. General Gordon, while the NSC review is assessing the value of the existing Russian nonproliferation programs, is there any corresponding high-level assessment of the adequacy of DOE core competencies and fundamental technologies to detect and monitor the development of weapons of mass destruction throughout the world?

General GORDON. There has been no NSC-level review of DOE proliferation detection and monitoring technical capability. However, the R&D program is reviewed annually as part of the preparation of the annual DOD/IC/DOE Counterproliferation Program Review Committee Report to Congress. The program is also coordinated within the interagency community as part of the Nonproliferation and Arms Control Technology Working Group. The NNSA Nonproliferation and Verification R&D Program was reviewed by the Nonproliferation and National Security Advisory Committee, an independent panel of external experts who found that the DOE core competencies and fundamental technologies supported by the R&D program underpin our Nation's capability to detect and monitor the development of weapons of mass destruction throughout the world. A copy of the Advisory Committee's February 25, 2000 report is attached.

DOE Research and Technology Against the Threat of Weapons of Mass Destruction

Review of the Department of Energy Office of Nonproliferation Research and Engineering (NN-20)

Department of Energy
Nonproliferation and National Security
Advisory Committee

February 25, 2000

Membership of the Department of Energy Nonproliferation and National Security Advisory Committee

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Dr. Victor Alessi, President and Chief Executive Officer, United States Industry Coalition, Inc.

The Honorable William Burns, Army War College (Major General U. S. Army, retired.)

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Assistant Secretary for Nonproliferation and National Security Rose Gottemoeller, who requested this review, set the tone by encouraging the Committee to look wherever it felt was necessary to carry out its work.

We especially thank Bob Waldron, Deputy Assistant Secretary for Nonproliferation Research and Engineering (NN-20) and NNAC Designated Federal Officer; Associate Deputy Assistant Secretary for Nonproliferation Research and Engineering Gerald Kiernan; NN-20 Program Managers Leslie Casey, Mike O'Connell, Steve Herrick, and Page Stoutland and members their staffs; and the many DOE laboratory scientists, engineers, and managers who briefed the committee, expressed their concerns, answered our questions, and replied to our survey questionnaires. We received complete and unhesitating cooperation at all times.

We also thank Bob Nurick, Olya Oliker, Charles Meade, James Bonomo, and Glen Buchan of RAND who provided valuable support to the committee in gathering and analyzing data and producing a much needed chronological and policy history of NN-20. We thank James Kelsey, Sandia National Laboratories (SNL) Director of Monitoring Systems and Technology, and Gary Mauth, SNL Senior Manager of DOE Remote Sensing Programs, and Wayne Shotts, Lawrence Livermore National Laboratory (LLNL) Associate Director for Nonproliferation, Arms Control and International Security (NAI), and David Dye, LLNL Head of NAI Technology Programs, for hosting the first and second meetings of the Committee, respectively, at their laboratories. We also thank the representatives of the NN-20 end-user community who met with us and provided insight into their needs.

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Above all, we wish to acknowledge the indefatigable and premier support provided by NNAC Executive Secretary Maureen McCarthy, Science Advisor to Assistant Secretary Gottemoeller.

Executive Summary

Origin of this Report

The Nonproliferation and National Security Advisory Committee (NNAC) was established in August 1999 at the request of the Secretary of Energy. The Advisory Committee reports to the Assistant Secretary for Nonproliferation and National Security (NN-1). The role of the committee is to advise the Department of Energy (DOE) on all aspects of its research and technology development programs for nonproliferation, arms control, and national security and the linkages of such technologies to national security policy (Appendix A).

The first charge to the NNAC was to review the R&D portfolio of the Office of Nonproliferation Research and Engineering, NN-20 (Appendix B). This report presents the findings and recommendations of the Advisory Committee.

Conclusions and Recommendations

The research portfolio of NN-20 supports broad national policies defined by the Executive Branch and Congress and by the need to capitalize on and sustain a robust nonproliferation and national security technology base that is forward looking.

The Office of Nonproliferation and National Security (NN) of the Department of Energy has responsibility for technology and policy development in support of national goals for nonproliferation of weapons of mass destruction and treaty verification. In the area of nuclear nonproliferation, DOE's Office of Nonproliferation Research and Engineering (NN-20) is the predominant sponsor of research and development of new technologies relevant to the nonproliferation mission that supports the national security community. This mandate reaches back to the Atomic Energy Commission. As part of a coordinated national plan, NN-20 has more recently been given the additional responsibility for developing technologies that support domestic U.S. chemical and biological counterterrorism goals.

Administration of the Office of Nonproliferation Research and Engineering (NN-20) requires attention to a wide spectrum of technologies and applications. The office supports directed-basic research, applied research, engineering development, prototype manufacture, and, in a few cases, manufacture of operational devices. NN-20 must respond on short notice to calls for support for international negotiations or agreements and at the same time must also anticipate future needs that are often not well defined. Finally, because NN-20 does not itself operate systems, it faces two difficult challenges: (i) it must transfer the technologies it develops to end-users elsewhere in government, primarily the Defense Department, the intelligence community, and law enforcement, and (ii) it must insure that the policy community is well-informed of the potential and limitations of technology.

The Administration of the NN-20 Office has performed well in recent years in carrying out its responsibilities across a widening spectrum of technology requirements and national policy needs, in spite of the fact its resources have not grown commensurately with its assigned responsibilities.

Significant improvements in the administration and execution of NN-20 operations have taken place since a review of the Office was conducted in spring of 1996 by an ad hoc external group. Nevertheless, the Advisory Committee feels there are additional changes in management practice at both the NN and the NN-20 levels that would further improve performance and quality. Implementation of the recommendations presented below would give other elements of the U.S. Government and the national scientific and technical community a greater understanding of and appreciation for NN-20's role and accomplishments.

NN should more fully integrate technology development and policy formulation and analysis in order to fulfill its role as the leading technical arm of the interagency nonproliferation policy community.

NN has the unique responsibility for bringing the scientific and engineering expertise of the DOE national laboratories to bear on the development of U.S. nonproliferation policy as well as to guide research at the laboratories in support of future policy requirements. To achieve better integration of technology and policy, the Advisory Committee urges that the following three recommendations be implemented.

Recommendation 1: Cooperative interactions between the technology and policy offices of NN should become a regular feature of the annual budget and planning process.

At an appropriate time in the budget cycle, NN policy offices should formally cite their nonproliferation technology needs to NN-20, and NN-20 should respond with its plans to address those needs. At other times of the budget year and in a more informal manner, NN-20 together with representatives from the DOE national laboratories should provide NN policy offices with information about new opportunities emerging from technological advances. The policy offices should in turn present their technology implementation plans and practices.

Recommendation 2: NN should assume the responsibility for communicating to the interagency policy community two categories of technical information: (i) the basic capabilities and limitations of today's technologies that support U.S. nonproliferation, arms control, and security objectives, and (ii) the mid- and long-term prospects for improved technologies relevant to the NN mission. This information, which we shall refer to as the Annual Nonproliferation Technology Assessment, should be made widely available within government in the form of a classified annual report or an equivalent communiqué.

Given its history and unique combination of technology and policy expertise, NN has an affirmative responsibility to keep the wider governmental community apprised of the potential--and the limitations--for technology to address national needs. No other unit of the U.S. Government is capable of doing so.

The Annual Nonproliferation Technology Assessment would primarily serve members of interagency groups engaged in developing options for nonproliferation policies and in preparatory work for arms control planning and negotiations and in supporting domestic counterterrorism objectives. However, the Assessment would also strengthen communications among DOE national laboratories and DOE headquarters and provide discipline among proponents of particular technologies by recognizing both the promise and limitations of a given approach.

Recommendation 3: The Advisory Committee recommends that the activities of the DOE Nuclear Transfer and Supplier Policy Division (NN-43) in promulgating lists of unclassified but export-controlled items be subject to review by representatives from the scientific community within NN. In case of conflict, the assistance of the NN Science Advisor should either settle the matter or refer it to higher authority in DOE.

The implementation of export controls on information (knowledge) is an area in great need of help from the technical community. NN has the responsibility, exercised through the NN-43 office, to publish lists of "sensitive unclassified technical information" and export-controlled information.

The breadth of the scientific and engineering work sponsored by NN-20 does not permit a common set of project selection and review procedures to be applied uniformly across its entire R&D portfolio.

Nevertheless, there are principles that can be applied across the portfolio and serve as guidelines to strengthen the selection and review processes and to ensure high quality. Such principles would serve as a unifying influence for choosing appropriate project selection and review procedures for each area of the NN-20 R&D portfolio.

Recommendation 4: NN-20 should expand its use of external merit reviews in project selection decisions and subsequent progress reviews, including it wherever feasible in managing its R&D portfolio.

Merit review is defined by two principal criteria: (1) scientific and technical quality, and (2) potential contribution to nonproliferation and national security goals. The extent to which merit review can be incorporated varies by program area. The chemical and biological nonproliferation program area of NN-20 has made commendable use of merit review for final project selection and some other program areas use it as well but in less explicit ways. For activities that are primarily applied, especially those serving highly classified applications, project selection and review procedures may need to be less open and inclusive, but they should always include individuals from outside of NN-20 and outside of the DOE laboratory community. Where special circumstances make this impractical, the reasons should be documented.

Recommendation 5: The transparency and documentation of the project selection and review processes for the NN-20 R&D portfolio need to be enhanced.

The NN-20 office should ensure that its selection and review procedures are well publicized and well documented. Regular procedures will ensure that the broader science and technology community is informed about the NN-20 program and its purpose and standards.

Recommendation 6: A clear balance needs to be established between the reviews that NN-20 program management conducts to fulfill its responsibilities and what is best done at the laboratory level.

DOE headquarters and the DOE national laboratories can and should have separate domains of accountability. Recommendations 4-5 above are intended as guidelines for all reviews and procedures, not as additional layers of review and management.

DOE Headquarters should focus its attention on initial project selection, end-user needs, integration of technology and policy, and interagency education. Headquarters should rely more on the science and engineering review processes at the laboratories than it currently does for making judgments about the technical progress of projects once they are underway, provided these reviews are done in a manner that is clearly articulated and include technical experts from outside the laboratory. For multi-laboratory projects or when significant technical or budgetary problems arise in previously approved projects at a single laboratory, a combination of headquarters and laboratory reviews would be appropriate. Annual reviews of all projects by NN-20 should continue; redundant reviews should be avoided.

Recommendation 7: Existing practices for NN-20 interactions with end-users need to be given greater visibility and articulation within NN and also in the wider interagency community.

Areas already exist where NN-20 has excellent communications with end-users and representatives from the end-user community are involved in review of programs and technical progress. By expanding and codifying practices within NN-20 that are most effective, relationships with end-users will become more fruitful. This is especially true when NN-20's work is closely tied to end-user needs. There can be unexpected benefits as well. Brainstorming with potential end-uses can sometimes lead to innovative ideas for new technologies.

Recommendation 8: To maximize the prospects for successful transfer of new technologies, communications with potential end-users should be opened as early as possible and proceed through all the phases of the work for which NN-20 has responsibility.

Discussions should be technical, but with the policy implications and costs spelled out with due regard given to the end-user's ability to make commitments to a technology in the development stage. It is important in the earliest phases of concept formulation that a prospective end-user be made aware of technological and scientific advances potentially available from an NN-20 project and that the uncertainties in those assessments be communicated as well. The Annual Nonproliferation Technology Assessment recommended above will help, but direct communications between NN-20 and end-users are needed as well.

There should be greater opportunity for the wider U.S. scientific and technical community to contribute to the success of the NN-20 portfolio. This can be done through open competition administered by DOE Headquarters and through partnerships chosen and managed by the DOE national laboratories.

The DOE national laboratories have a strong history of interaction with the larger scientific and technical community. Participation of non-DOE personnel in NN-20 projects has been successful. The participation of appropriate institutions outside of the DOE national laboratories draws into the NN-20 portfolio the expertise of the broader U.S. scientific and technical enterprise.

Recommendation 9: Program areas of the NN-20 portfolio that are chosen for open competition should be ones in which high expertise already exists in the academic sector and/or the industrial sector.

The NN-20 budget is too small to fund development of expertise in nonproliferation or verification technologies where it does not already exist. Furthermore, it would be wasteful to duplicate expertise that already exists at the DOE national laboratories. For academic competitors the work will need be restricted to the unclassified level or special arrangements made.

Areas that come to mind as candidates for open competition include seismic verification technologies for very low yield underground nuclear tests and chemical and biological agent detection and identification technologies. Other possible areas might be specialized electronic chip development and certain radio-frequency technologies. Many parts of the NN-20 R&D program are unsuitable for competition that reaches beyond the DOE national laboratories.

Recommendation 10: NN-20 should document more systematically funding that goes directly to institutions outside of the DOE system as well as funding that goes to the DOE national laboratories and then goes out to consultants, subcontractors and collaborators.

Partnerships in the form of consultantships, subcontracting, sabbatical visits, etc., involving academic researchers and subcontracting with industry for development and manufacture are all mechanisms with which the DOE national laboratories have much experience. These are clear evidence that the DOE national laboratories reach out to the broader science and technology community when the needed expertise is not available in-house. The recommended documentation will give greater visibility and clarity to existing practices.

The DOE national laboratories were created as partners to the U.S. Government under contracts documenting that partnership, not as contractors in the ordinary sense. Their continued existence requires that they remain centers of excellence and responsive to national needs.

Recommendation 11: NN-20 headquarters and administrators at the DOE laboratory complex who manage funds received from NN-20 should work together to identify metrics that will serve as objective indicators of the quality of the work performed and the impact of that work on nonproliferation and national security goals. Records of quality and impact should be kept and reported on a regular basis.

The diversity of the NN-20 portfolio means that no single set of metrics will be suitable for all areas. Metrics used to evaluate the quality of NN-20 projects and program management should be chosen in a manner matched to the activity being evaluated.

The Committee does not wish to suggest specific metrics. There are many possibilities worth considering. For work at the basic scientific level, publications, invited talks, and research funds received on a competitive basis—the norm in the academic community—can be used for evaluation, but this is suitable for only a small part of the NN-20 R&D portfolio. For applied research and for development activities, metrics that correspond to success in moving projects toward nonproliferation and national security objectives in cost effective ways (and for terminating them when initial expectations prove unjustified!) and for interacting effectively with end-users are needed. Prizes for research and technology achievements, testimonials from end-users of NN-20 technologies, and citations of locations and exercises at which NN-20 technology have been used are possibilities.

Indicators of the quality of individuals funded by NN-20 should be included as well, whether or not the indicators refer directly to NN-20 activities. For example, the selection of an NN-20 supported scientist or engineer for service on an interagency group, receipt of an award from a Laboratory Directed Research and Development (LDRD) competition, patents granted, and the like should all be used.

Most DOE national laboratories have one or more external advisory committees. Reports from such committees usually review performance and can be useful sources of information on the quality of personnel, programs, and projects.

Classified work is intrinsically more difficult to evaluate because the peer group is often small, but a good faith effort needs to be made in every case.

The DOE national laboratories collectively constitute a major sector of the nation's science and technology enterprise along with the academic and industrial sectors. The health of the DOE sector is important to all the other sectors.

Each of the sectors of the national science and technology enterprise has unique capabilities and there are areas of complementing, and in some cases intersecting, expertise—a healthy situation. Each sector contributes to the vigor and quality of the overall national enterprise, and each contributes to national security and the well being of the country.

Recommendation 12: Within the constraints imposed by the need to protect classified information, greater efforts should made to increase professional contacts and interactions between scientists and engineers engaged in NN-20 projects at the DOE national laboratories and members of the larger national scientific and engineering communities.

Professional contacts and interactions are essential to maintaining vibrant scientific and technical work. They can be achieved, for example, by means of seminars, conferences, and exchanges of scientists and engineers. Maintaining contact with the outside national scientific and engineering communities will become all the more important as NN-20 moves with NN into the new DOE National Nuclear Security Administration.

There are, of course, areas where security needs preclude any outside interactions, but this requirement should not drive a restrictive policy that is applied to all areas. For example in the chemical and biological disciplines, the unclassified community outside of DOE has vast resources and knowledge that cannot be duplicated by DOE. DOE scientists and engineers must remain connected to this larger community.

The DOE national laboratories comprise a diverse group of scientists and engineers who understand the signatures of the proliferation of weapons of mass destruction, the technologies that can be marshaled to exploit these signatures, and the requirements of the end-users in the national security community. This unique combination of expertise exists only in the classified environment of the DOE national laboratories. We refer to it as the nonproliferation and national security technology base (NN Tech Base).

DOE laboratory administrators, scientists, and engineers have long expressed concern that the NN Tech Base was endangered, but little or no attention has been paid to these concerns. The one-third reduction in the DOE national laboratories' authority to "tax" programs to fund LDRD budgets in the current fiscal year will further diminish the NN Tech Base.

The NN Tech Base in the DOE laboratory complex is shrinking due to recurrent under-funding. Current trends need to be reversed.

The Advisory Committee recognizes that no single agency or office can be the sole guarantor of the NN Tech Base. However, the Office of Nonproliferation Research and Engineering (NN-20) has long been a key shareholder through its support of the development of technology linked to its nonproliferation and national security objectives. The Office must remain a strong supporter.

Recommendation 13: DOE should seek increased funding for NN-20 for the support of advanced concepts research on nonproliferation and national security technologies in future years. This might be done in steps starting at a level of 5% of the NN-20 R&D budget and growing to 10% or more over time.

An NN-20 budget line named "advanced concepts" has been lost in recent years as DOE was required to take on new nonproliferation technology initiatives but was not given corresponding increases in budget. Restoration of advanced concepts funding should be a high priority.

The need for a stable level of funding for advanced concepts is easily understood. Such funding allows scientists and engineers of the NN Tech Base the opportunity to spend a small fraction of their time conceiving and exploring new ideas that may offer fundamentally new and more capable nonproliferation and national security technologies than those currently available or under development—in other words, the opportunity to be creative in an applied context. Funding for advanced concepts is important in its own right, and it will also help attract the best and the brightest of new generations of scientists and engineers to the NN Tech Base.

A portion of NN-20 R&D portfolio must continue to be flexible and go to the DOE national laboratories in support of high-quality, creative research on future nonproliferation and national security technologies.

Advanced concepts research need not necessarily have a definite end-user, but the scientists and engineers involved should be motivated by possible applications for their work. Indeed, it would be counterproductive to national security to require that all work on nonproliferation and national security technologies be driven by the immediate needs of users. Focusing exclusively on immediate needs, as has happened at some federal laboratories, inevitably turns innovative programs, such as those in the NN-20 R&D portfolio that can occasionally make revolutionary advances, into an evolutionary programs that ultimately become stagnant and produce little of real value.

As a general rule, NN-20 does not carry the development of technologies into the manufacturing stage.

The prime exception occurs for satellite-based sensors that are designed to detect nuclear explosions in the atmosphere or in space. Nuclear Detonation Detection System (NDS) packages are deployed as secondary payloads on ballistic missile infrared early warning Defense Support Program (DSP) satellites and on satellites of the Global Positioning System (GPS).

Recommendation 14: DOE/NN should conduct a study assessing the desirability of DOE continuing to be the manufacturer of operational satellite-based Nuclear Detonation Detection System (NDS) packages. The study should involve participation of all stakeholders.

The key question to examine in the study is whether it might be better to follow an alternative model for the manufacturing stage, a model more in line of what NN-20 does in the rest of its R&D portfolio. Namely, NN-20 would carry the development of new-generation NDS packages through the prototype development and testing stages, and then turn the drawings and specifications over to an industrial manufacturer selected on a competitive basis. DOE scientists and engineers would remained involved as consultants to resolve problems that arise in manufacture and help with liaison to the Air Force Project Office that has responsibility for the GPS.

The question should be decided on the basis of what is best for the country and makes the best use of expertise at the DOE national laboratories. It may be that there is no industrial interest or insufficient industrial expertise in the specialized areas involved in manufacturing the NDS packages to change the way that manufacturing is done now.

(Throughout this report, we use the term "DOE national laboratories" to refer to all DOE laboratories that are officially titled national laboratories as well as DOE facilities that have technical expertise directly related to the nonproliferation mission.)

Table of Contents

1: Nonproliferation and the Department of Energy

The U.S. Department of Energy (DOE) plays a major role in the development of policy and technology in support of U.S. Government efforts to combat the proliferation of weapons of mass destruction. The work of DOE supports the Department of State, Department of Defense, Intelligence Community, Department of Justice, and other elements of the national security community. In this section we review the policy dimension of DOE's involvement. Appendices C and D provide additional information.

Making of U.S. Nonproliferation Policy

In accord with the terms of the Constitution, the President and the Executive Branch set the guidelines for all U.S. foreign policy, including nonproliferation policy. Congress influences foreign policy and nonproliferation policy through the legislative process and through its oversight responsibilities, including Senate consent (or lack thereof) to ratify international treaties, appropriations, and at times with explicit directions with respect to specific programs. National security policy initiatives are developed and implemented by the President through a systematic process established by Congress in legislation, beginning with the National Security Act of 1947. Nonproliferation policy for weapons of mass destruction (WMD) is formulated through an on-going process led by the President and implemented by the executive agencies. The National Security Council (NSC)--consisting of the President, Vice President, the Secretaries of State and Defense, with the Director of Central Intelligence as the intelligence advisor and Chairman of the Joint Chiefs of Staff as the military advisor, and other senior government officials whose expertise is required by the President for specific issues--is at the apex of this process. The Secretary of Energy is included when issues involving the responsibilities and capabilities of DOE, such as energy resources, nuclear weapons, and nonproliferation, are under consideration.

Much of the preparatory work of the National Security Council is done in the "Deputies Committee", where the Deputy Secretary of Energy represents the Department. Interagency Working Groups (IWGs), at which U.S. Government agencies are represented at the Assistant Secretary level, prepare detailed positions on issues and make policy decisions where consensus agreement can be reached. Task forces and committees deal with specific elements or issues being considered by the National Security Council and provide technical support to IWGs. Committees and task forces are often chaired or co-chaired by DOE representatives when the subject matter pertains to the Department's areas of expertise and responsibility.

U.S. Nonproliferation Policy Today

The goals of U.S nonproliferation policy are to prevent and reverse the spread of nuclear weapons; safeguard special nuclear weapon materials; eliminate chemical and biological weapons world-wide; prevent the spread of ballistic missiles; and promote effective, verifiable arms control agreements.

Nuclear nonproliferation goals include:

- Eliminate the testing of nuclear weapons to strengthen the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) regime,
- Expand nuclear-weapon-free zones,
- Assist in the prevention of nuclear proliferation from the former Soviet Union,

- Engage China in cooperative efforts to curb proliferation,
- Freeze North Korea's nuclear program,
- Halt and reverse the development of nuclear weapons in South Asia,
- Achieve a global fissile material production cutoff,
- Safeguard highly enriched uranium and weapon-grade plutonium stocks,
- Decrease highly enriched uranium inventories by conversion to low enriched uranium for reactor use,
- Encourage the use of most proliferation resistant fuel cycles in the nuclear power industry and in research reactors worldwide, and
- Promote safe and secure disposition of plutonium.

Chemical and biological weapons nonproliferation goals include:

- Achieve full implementation of the Chemical Weapons Convention (CWC),
- Strengthen the Biological Weapons Convention (BWC) by means of a Protocol on Verification,
- Eliminate former chemical and biological weapons stocks and facilities world-wide as required under the CWC and BWC,
- Assist Russia in the destruction of its chemical weapons,
- Control chemical and biological weapons-related technologies, and
- Monitor dual-use technologies.

U.S. nonproliferation policy includes a strong commitment to regional security. This includes, for example, preventing Iran and Iraq from acquiring weapons of mass destruction and ballistic missiles. It also includes promoting stability in South Asia by persuading India and Pakistan to abjure nuclear weapons testing, forego destabilizing nuclear and missile activities, and, ultimately, accede to the NPT. Another major component of U.S. nonproliferation policy is to redirect the efforts of former Soviet weapons scientists to peaceful endeavors

DOE's Role in Nonproliferation Policy

The Department of Energy is not only a participant in the making of nonproliferation policy; it has a major role in implementation as well. There are both historical and technical reasons why weapons of mass destruction proliferation prevention is one of the Department's most critical missions.

Nonproliferation activities at DOE are carried out principally in the Office of Nonproliferation and National Security (NN), Defense Programs (DP), Fissile Material Disposition (MD), and the Office of Intelligence (IN). Each of these entities depends heavily on the DOE national laboratories for technical expertise, including assessments of technical requirements and viability related to nonproliferation policy.

The NN Office will be included in the mission of the National Nuclear Security Administration (NNSA), which is to be established in March 2000. The *Department of Energy National Nuclear Security Administration Implementation Plan* (January 1, 2000) outlines organizational changes relevant to NN, as follows:

> "The Office of the Assistant Secretary for Nonproliferation and National Security will be re-designated as the Office of the Deputy Administrator for Defense Nuclear Nonproliferation. The Office of Fissile Materials Disposition will be incorporated within this Office. The Assistant Deputy Administrator for Fissile Materials Disposition also will serve as the Special Secretarial Negotiator for Plutonium Disposition.
>
> The Implementation Plan provides that, in general, employees currently funded under either the Nonproliferation and National Security or Fissile Materials Disposition program direction accounts will be designated as employees of the Administration. Their roles and responsibilities will remain essentially unchanged, focusing on the continuing missions of the programs. The Deputy Administrator will carry out the duties specified in the section 3215(b) of the NNSA Act. Pending confirmation of a Deputy Administrator, the current Assistant Secretary for Nonproliferation and National Security will serve as the Deputy Administrator."

DOE derives its fundamental authority in the nuclear nonproliferation area from the Atomic Energy Act of 1954, as amended, together with a host of additional statutes that address matters including protecting national security information, controlling exports of WMD-related materials and technology, and preserving the environment. U.S. obligations under international treaties and agreements that seek to control, reduce, or eliminate WMD and protect the interests of the United States and its citizens often produce additional nonproliferation and verification responsibilities for the DOE, due to its unique capabilities and expertise. Presidential statements of policy and guidance, issued in the form of Executive Orders and Presidential Decision Directives, are another source of the Department's policy mandate.

DOE has dual responsibilities with respect to nuclear weapons: (i) sole responsibility for research, development, and stewardship of nuclear weapons, and (ii) lead responsibility for nuclear nonproliferation technology. These twin responsibilities derive from and draw heavily upon the base of expertise and knowledge resident in the DOE nuclear weapons complex and the broader system of national laboratories operated by DOE. (Here, and throughout this report, we use the term "DOE national laboratories" to refer all DOE laboratories that are officially titled national laboratories as well as DOE facilities that have technical expertise directly related to the nonproliferation mission, such as Ames Laboratory, Environmental Measurement Laboratory, Remote Sensing Laboratory, Savannah River Technology Center, and the Special Technologies Laboratory.) The Department's influential role in nuclear nonproliferation policy derives from this capabilities base. DOE participates in virtually every aspect of nuclear nonproliferation policy formulation and implementation.

The Department's involvement in chemical and biological weapon nonproliferation policy is more recent, but has historical roots as well. The need to understand the effects of ionizing nuclear radiation on biological systems led to the development over time of substantial biological expertise at many DOE laboratories. A multitude of other program needs--some nuclear related, some environmental, and some opportunistic--led to the development of chemical expertise within the DOE laboratory system as well.

Over the decade of the 1990s, concern that biological and chemical weapons might be used by states or terrorist groups with animosity toward the U.S. or its allies has become a major national security issue. The chemical and biological expertise resident in the DOE national laboratories, together with DOE's long experience in (nuclear) nonproliferation policy and technology, resulted in the Department being recognized as an able, effective, and indeed critical, participant in developing national strategy and technology to confront the new threats. DOE's role in chemical and biological weapons nonproliferation policy development is shared with many other federal agencies. DOE's technology role is focused primarily on technology against the domestic chemical and biological terrorism threat, but there is much synergy between the domestic problem and the battlefield chemical and biological threat for which the Department of Defense has the lead.

DOE Office of Nonproliferation Research and Engineering

One of DOE's most important nonproliferation roles is the sponsorship of an extensive R&D program under the Office of Nonproliferation Research and Engineering (NN-20). A large fraction of that work is carried out at the DOE nuclear weapons laboratories: Los Alamos National Laboratory, Lawrence Livermore National Laboratory, and Sandia National Laboratories. Other DOE laboratories—including Argonne National Laboratory, Brookhaven National Laboratory, Idaho National Engineering and Environmental Laboratory, Oak Ridge National Laboratory, Pacific Northwest National Laboratory, Remote Sensing Laboratory, the Savannah River Technology Center—as well as selected industries and universities also make important contributions to nonproliferation technology under NN-20 sponsorship.

The NN-20 Office is the predominant government entity responsible for the development of nonproliferation technology. NN-20 manages a program of approximately $220 million per year for science and engineering programs in support of nonproliferation, intelligence, arms control, and national security technologies.

NN-20's research and development program is focused on identifying basic and applied technologies that have promising nonproliferation and national security applications and advancing them to the prototype stage. The Director of the NN-20 Office co-chairs the interagency Nonproliferation and Arms Control Technology Working Group (NPAC TWG), which is responsible for coordinating government-wide research and development in the area of arms control and nonproliferation. The NPAC TWG reports equally to the relevant NSC policy IWGs and the Council on National Security (CNS) within the National Science and Technology Council (NSTC) structure, and is the most important forum in which the work of NN-20 is vetted with DOE's interagency national security partners. Because of its ready access to the expertise resident in DOE's national laboratories, NN-20 is often relied upon by the interagency community to address the most difficult nonproliferation requirements. NN-20 is also called upon by the interagency community when quick, technical answers are needed to critical questions related to nonproliferation and national security.

The objectives of NN-20 are to develop, test, and demonstrate:

- Technologies that can locate, identify, and characterize nuclear explosions underground, underwater, in the atmosphere, and in space in accordance with U.S. National Technical Needs and verification requirements for nuclear test ban treaties;

- Technologies needed to detect by remote means the early stages of a proliferant nation's nuclear weapons program;

- Radiation detection technologies for nuclear materials protection, control and accounting, nuclear warhead dismantlement, law enforcement forensics, and intelligence support;

- Technologies capable of detecting and deterring the diversion and smuggling of nuclear weapons and special nuclear materials; and in partnership with other agencies,

- Advanced technical capabilities that can dramatically improve the U.S. domestic capability to prepare for, detect, and respond to chemical and biological terrorism.

The technical objectives listed immediately above are integral to the U.S. nonproliferation and arms control strategy described earlier in this section. The goals are to advance existing detection capabilities for all types of WMD, to make it possible in the future to carry out monitoring functions that are not feasible now, and to understand the technical limits of both non-cooperative and cooperative monitoring approaches. The NN-20 program is responsive to the goals and needs of U.S. nonproliferation policy and is coordinated with the national security community by means of the interagency NPAC TWG and other means.

NN-20 objectives are currently carried out within the following four principal research and engineering program areas of NN-20's R&D portfolio:

- Nuclear Explosion Monitoring--developing sensors and systems that enable the U.S. to monitor nuclear explosions in any medium and at any place using national technical means and to support U.S. international obligations.

- Proliferation Detection--developing remote sensors and sensing systems to detect the physical signatures of nuclear proliferation as well as effluents from facilities that might be associated with nuclear processes. (Some of these technologies may also have application to detecting chemical and biological weapons proliferation.)

- Proliferation Deterrence--developing on-site and off-site detection and analysis systems for micro-samples of material obtained cooperatively or by other means from a site or facility that might be associated with nuclear proliferation. (Some of these technologies may also be applicable to chemical and biological weapons nonproliferation.)

- Chemical and Biological Nonproliferation--developing technologies and integrated systems that will increase U.S. domestic preparedness against terrorist acts involving chemical or biological agents.

As part of the larger U.S. Government research and development portfolio, the NN-20 R&D portfolio is subject to the broad tenets of U.S. science and technology policy. Among these are: expanded use of independent review to ensure quality and the development of partnerships with universities and the private sector.

Based on the foregoing analysis of the Department of Energy's role in nonproliferation and its technical capabilities, the Advisory Committee reviewed the NN-20 portfolio to determine how well it addresses nonproliferation and national security objectives, meets high standards of technical quality, satisfies the needs of end-users, and constitutes a balanced program.

2: Relationship of Policy to Technology in NN

The Policy-Technology Partnership

The effectiveness of arms control and nonproliferation policies has historically depended on understanding and mastering technology. The capabilities of science and technology have frequently shaped the content of U.S. efforts in arms control and nonproliferation during the cold war. More specifically, in almost all cases it was the efficacy of national technical means of verification that determined the kind of strategic offensive arms limitations possible and acceptable to treaty signatories.

In the 1980s, the advancement of on-site hydrodynamic yield measurement techniques (CORRTEX) by scientists and engineers at the DOE weapons laboratories provided a complementary verification technology to traditional teleseismic verification, and thereby facilitated ratification of the Threshold Test Ban Treaty (TTBT) and Peaceful Nuclear Explosions Treaty (PNET) by the United States. In addition, work conducted over four decades by scientists and engineers in the academic community, industry, and the DOE laboratories has greatly improved teleseismic capabilities for nuclear explosion monitoring. More recently, regional seismic research and development have further improved those capabilities.

Technical experts who understand the policy dimensions of the arms control process have always been essential to formulating and implementing effective arms control and nonproliferation policy. The number of scientists and engineers in the arms control and nonproliferation community within the U.S. Government has declined in recent years. This is especially unfortunate given that many of the "easy" arms control and nonproliferation measures have now been achieved. The next steps in the WMD nonproliferation effort will require more sophisticated solutions to the implementation and verification challenges and even tighter integration of technology and policy.

The next round of strategic arms reductions is expected to call for the number of strategic nuclear weapons to be reduced well below the levels of the Strategic Arms Reduction Treaty (START) II. In addition, the past practice of limiting and reducing launchers, missiles, or aircraft (large items) rather than warheads (small items) will not be adequate, even with the end of the cold war. Actual warheads will have to be counted, tracked, and verifiably disassembled. If even lower numbers of nuclear warheads are negotiated at a future date, the U.S. must be able to verify that other states do not have large unaccounted nuclear warhead stockpiles or significant fissile material reserves. The ability to be certain that no hidden stockpiles exist will be critical for a United States that has deeply reduced its nuclear forces. The challenge is to develop verification technologies that produce meaningful data yet protect classified nuclear weapon design information.

There are numerous other examples of the need for technical expertise in formulating and implementing arms control and nonproliferation policies. The U.S. appears certain to want to improve its capability of detecting nuclear tests at yields below the values that have been achieved to date. The development of more sensitive detection and verification tools will require scientists who are able to understand the strengths and weaknesses of possible evasion schemes. Although the technical issues are entirely different, a similar situation exists for the Chemical Weapons Convention (CWC) and the Biological Weapons Convention (BWC). Both of these treaties are currently difficult to verify and may become increasingly so as dual-use technologies become more broadly available. However, not all trends are unfavorable. Sensor miniaturization, signal processing capabilities, global communications, DNA sequencing identification for biological materials, and other technological advances are likely to open new possibilities for detection, verification and intelligence collection.

In short, the future will require more, not less, attention to technology for arms control, intelligence, and nonproliferation purposes. This comes at a time when the scientific expertise within the U.S. Government is decreasing, especially in the policy community. How can the United States take maximum advantage of technology to solve the new challenges if there is little systematic and organic connection between the policy and technical communities? How will the policy community grasp the technical possibilities for meeting today's and tomorrow's challenges if there is no way for the policy community to keep up-to-date on scientific advances? The technical community needs to be present at the deliberations of the policy community.

Leadership Role for NN

DOE has a unique opportunity and affirmative responsibility to bridge the nonproliferation policy and technology communities, not only within the Department but also in the U.S. Government generally. Both communities come together in NN, the only entity in a major governmental agency in which policy, implementation, and technology are combined. No other agency is so appropriately structured and no other agency has such ready access to the expertise present in the DOE national laboratories.

The Office of Nonproliferation and National Security should take greater advantage of its position to facilitate the integration of technology and policy. Too few of the technologies that NN-20 is sponsoring are linked to DOE policy offices that have representatives on interagency policy groups and task forces. NN has the mission to serve both DOE and the broader national security community, but a proper balance needs to be maintained.

There are good examples of successful integration of policy and technology within NN, and we recognize and applaud these accomplishments. For example, NN policy experts have made and continue to make extensive use of NN-20 funded work at the DOE laboratories to solve the daunting verification problems raised by START III. Another example of a successful policy and technology integration within NN is the strategic plan for the role of the DOE community in the national response to the threat of domestic terrorism by chemical or biological means. The plan lists the primary technical capabilities that need to be developed through a cooperative effort between DOE/NN, Department of Defense, Health and Human Services, and the investigative and disaster response agencies. The strategy includes detection, prediction, restoration and recovery, therapeutics, forensics, and systems analysis. The plan enumerates programs in each area. However, even here there is something missing: the plan is silent as to what technical products are expected and on what time-scales.

The implementation of export controls on information (knowledge) is an area in great need of assistance from the technical community. NN has the responsibility, exercised through its NN-43 Program, to publish lists of "sensitive unclassified technical information" and export controlled information. The lists published to date in both categories are highly simplistic, damaging to the performance of technical work, and of no benefit to national security. The terms used in these lists are so broad and ill-defined that technical performers have no way to judge whether their careers will be in jeopardy if they discuss unclassified subjects in ordinary work situations where foreign nationals may be present, such as meetings of professional societies.

The activities of NN-43 in promulgating lists of unclassified but export-controlled items should be subject to review by representatives from the scientific community within NN. In case of conflict, the NN Science Advisor should be called in to either settle the matter or refer it to higher authority in DOE.

Strengthening the Policy-Technology Partnership

The technology programs of NN-20 and associated DOE laboratory scientists and engineers appear to have insufficient institutionalized contact with the policy and implementation divisions of the interagency community. This restricts the flow of technical knowledge and information about NN-20 R&D programs out to the larger community and the reverse flow of information from the policy community about its emerging needs and the shortcomings of current technology. If the need for a more substantive interaction between the two communities is left unaddressed, DOE's influence at the interagency working level will erode at the very time the policy community needs improved access to the technical community.

NN should take explicit steps to ensure greater two-way interactions between NN-20, the NN policy offices, and the wider interagency community. An initiative consisting of multiple elements is most likely to succeed.

A mechanism is needed to insure greater integration between policy and technology within NN itself. For example, it would be useful to institute a process by which the policy divisions of NN would formally articulate their needs and their impressions of the needs of the interagency community at an early stage of development of the budget for the NN-20 R&D portfolio. NN-20 program managers would respond in turn with their plans to address those needs. These documents should not be complex and should be coordinated by NN-1. At a later stage in the process, members of the interagency Nonproliferation and Arms Control Technical Working Group (NPAC TWG) could be invited to offer comments and advice on plans for the NN-20 R&D portfolio.

Other integration steps within NN could be less formal and separate from the budget process. For example, NN-20 together with representatives from the DOE laboratories could provide NN policy offices with information about new opportunities emerging from technological advances. The policy offices could in turn report to NN-20 what technologies are being used and where improvements or new capabilities are needed. Representatives from the larger interagency community could be invited to join in those exchanges.

The interagency policy community outside of DOE also needs to be involved in the integration process. Few communications from the science and technology community to the policy community comprehensively describe the status of R&D efforts that address current objectives for verification and nonproliferation technologies. There is a serious lack of understanding in the policy community about the potential for technological advances beyond current objectives, the possibilities of fundamentally new capabilities, or the technical limitations of current and prospective technologies.

NN should assume the responsibility for communicating to the interagency policy community both the *limitations* and the *potential* of science and technology to meet nonproliferation, intelligence, and verification objectives. This information, which we shall refer to as the Annual Nonproliferation Technology Assessment, should be made widely available within government in the form of a short classified annual report or an equivalent communiqué. The NN Science Advisor should assume overall responsibility for the assessment, with major contributions coming from NN-20 and the DOE laboratories with expertise in nonproliferation, intelligence and verification.

An Annual Nonproliferation Technology Assessment would enable more coherent R&D goals to be formulated for the U.S Government generally, and for the NN-20 Office in particular. It would also give the policy community a better understanding of what technology is being developed and what to expect from it. By documenting the close synergy between technology and policy, NN can demonstrate the value of its R&D program more effectively to both the Executive and Legislative branches and gain the long-term support needed to address tomorrow's challenges.

Our recommendations are not meant to imply that all projects in NN-20 R&D portfolio must be directed to specified goals. On the contrary, we believe that management of the NN-20 R&D portfolio should reflect a balance between two distinct responsibilities. NN should provide strong encouragement for *decentralized initiatives* within the technical community for developments that will advance nonproliferation and national security technologies. At the same time NN must also provide technical support of the near- and long-term objectives of the policy community. Improved communication between the policy and technical communities is essential to the success of future nonproliferation and national security efforts.

3: End-Users of NN Technology

A Multidimensional Relationship

The R&D portfolio of the Office of Nonproliferation Research and Engineering (NN-20) serves a diverse set of end-users: Department of Energy, Department of Defense, Intelligence Community, Department of State (Arms Control), Department of Justice (FBI), and Customs, among others. As the NN-20 Chemical and Biological Nonproliferation program develops, this list is growing to include state and local law enforcement, emergency response, and public safety authorities. This diverse environment—intrinsic to the nonproliferation problem—makes the task of transferring the knowledge and technology created by NN-20 to end-users especially challenging.

The technical products of NN-20's work on nonproliferation and national security problems must be transferred to end-users. Successful transition of technology may be the most difficult of all the responsibilities incumbent upon NN-20. In some program areas, the current modes of interaction between NN-20 and end-users of its technology are the products of long-term relationships well understood by all parties involved and very successful. In other program areas, current relationships appear ad hoc, idiosyncratic, and fragile.

Existing practices for NN-20 interactions with end-users need to be given greater visibility and articulation within NN and also in the wider interagency community.

Strengthening the Relationship

The Annual Nonproliferation Technology Assessment, recommended as a means of improving substantive communications between the science and technology community and the nonproliferation policy community, will also facilitate NN-20 interactions with end-users. In addition to the assessment, NN could offer periodic briefings (once or twice a year) to potential end-users to keep them aware of what might be possible in their fields of endeavor and to provide a forum for the end-users to inform NN-20 of their needs and experience with existing technologies.

The adoption of the "merit review" approach we recommend would further assist in keeping end-users in mind in NN-20 project selection and reviews. Inviting representatives from the end-user community to participate in these reviews on a regular basis, as NN-20 does already in some cases, would also be beneficial.

Some NN-20 programs may lend themselves to a scenario-based approach to determine what attributes and capabilities of a proposed technology are necessary to make it most useful to the end-user. Scenarios naturally facilitate early end-user involvement. End-users need to be involved in selecting "credible" scenarios and in playing through them. The NN-20 Chemical and Biological Nonproliferation program appears to be making good use of this approach. But more is needed.

Communications with potential end-users should be opened as early as possible for each new project and continue through all the phases (research, development, and demonstration) for which NN-20 is responsible. Well before a project matures, the planning should include the technology transfer. Obviously, binding agreements cannot be expected at early stages of a new technology and the prerogatives of the end-user decision-making process must be respected. Nonetheless, substantive technical exchanges and memoranda of understanding can be very helpful. Projects in which the end-user provides partial support in funding or in kind are clearly ideal, but NN-20 should not require this. It would be impractical and self-defeating.

Exceptions to the general rule that end-users should be involved in NN-20 projects at the early stages must be allowed, and guidelines clearly defining them should be established. One important class of exceptions should be small, exploratory projects designed to see whether a technical idea with a plausible application to an NN mission is feasible. We refer to such research as "advanced concepts." For advanced concepts, there is no need to engage an end-user until technical feasibility has been proven.

As in the past, cases will arise in the future where a potential end-user loses interest in an NN-20 project already underway and no other interested party comes forward. In such cases, NN-20 should terminate the project. Conversely, there will also be cases where the end-user remains interested but the cost, capability, or time-scale of the project changes such that it no longer justifies NN-20 support and must be cancelled. As in any relationship, good communications cannot guarantee happiness, but they help minimize surprises.

Operational Equipment

There is one exception to the general rule that NN-20 does not carry the development of technology into the manufacturing stage. The exception applies to the specialized satellite-based sensors that detect nuclear explosions in the atmosphere or in space. These sensors are deployed as secondary payloads on infrared early warning Defense Support Program (DSP) satellites and on the satellites of the Global Positioning System (GPS).

Having DOE manufacture the operational nuclear detonation detection system (NDS) packages for satellites is a legacy reaching back to the VELA era when satellites dedicated *solely* to the task of detecting nuclear explosions were deployed following the signing of the 1963 Limited Test Ban Treaty. This practice has a long and successful history, and many generations of NDS improvements using NN-20 technology have been deployed. Nevertheless, the practice is an anomaly. For the next round of NDS improvements, DOE laboratories will be manufacturing instrumentation for as many as 24 to 30 operational units to be carried on the next generation Block IIF GPS satellites.

A careful study should be done of the current practice of having DOE manufacture NDS operational packages. The study should involve the participation of all stakeholders. The key question should be: What approach is best for the country?

The study should determine whether or not it would be better to follow a model similar to what NN-20 does in the rest of its portfolio. Namely, NN-20 would be responsible for the research and development of new generation NDS packages through the prototype demonstration and testing stages and then turn the drawings and specifications over to an industrial manufacturer selected on a competitive basis. DOE scientists and engineers would remain involved as consultants to resolve problems that arise in manufacture and assist with liaison to the Air Force Project Office responsible for the GPS system. This approach would be analogous to the way that Lincoln Laboratory transitioned EHF satellite communications technology to industry after first successfully demonstrating it on experimental satellites. Whatever the conclusions of the study, current schedules for NDS upgrades for GPS should not be disrupted.

End-Users of NN-20 Technology

AFTAC

The Air Force Technical Applications Center (AFTAC) is a long-term end-user of the technology developed by the NN-20 Nuclear Explosion Monitoring program. AFTAC has the operational responsibility for ground-based and satellite-based sensor systems that provide national technical data for verification of nuclear test ban treaties and nuclear explosion monitoring. NN-20 is for all practical purposes the sole developer of technology for the Center.

NN-20's relationship with this end-user is very solid--a success story of several decades. This success has been facilitated by the fact that the treaties supported by this program generally provide well-defined technical verification requirements and involved the technical community, including NN-20, in the development of those requirements. Further contributing to the success has been the high priority the United States has always given to treaty verification. Historically, full and reliable levels of funding for treaty monitoring technology development have existed. AFTAC regards its relationship with NN-20 as excellent.

Intelligence Community

Another major user of NN-20 technology is the U.S. Intelligence Community (IC), which has responsibilities for verification of nuclear arms control treaties and identifying activities indicative of the proliferation of weapons of mass destruction. The IC is a potential end-user of the remote sensing technologies being developed by NN-20's Proliferation Detection program to detect (before actual nuclear testing occurs) signatures of a nuclear weapons program. The micro-sample material identification technologies being developed under NN-20's Proliferation Deterrence program are also likely to be of interest to the IC. The primary focus of both the NN-20 Proliferation Detection and Proliferation Deterrence programs is nuclear proliferation, but several of the technologies under development, if successful, may have applications to chemical and biological proliferation, provided reliable signatures exist at detectable levels.

The relationships between the IC as an end-user and NN-20 as a technology provider are complex. They range from analysts needing help from DOE laboratory scientists to interpret data, to communications with members of the IC seeking new collection capabilities. End-users in the IC find their relationship with NN-20 valuable and important.

DoD/DTRA

The Defense Threat Reduction Agency (DTRA), which has responsibility for on-site inspections and monitoring activities established by treaties and other agreements, receives many types of technical assistance from NN-20. Past examples include the on-site inspection technology applied to the Intermediate Nuclear Force Treaty (INF), and technologies to assess the contents of chemical warheads without disassembly in support of the Chemical Weapons Convention (CWC). In addition, monitoring technologies are being developed by NN-20 to support bilateral agreements with Russia for safe storage of fissile materials. DTRA itself funds work at the DOE laboratories, drawing upon the same technical expertise in the chemical and biological areas that supports the NN-20 Chemical and Biological Nonproliferation program; such practices build useful bridges. DTRA finds its cooperative relationship with DOE and the support it receives from NN-20 highly beneficial.

Interagency Nonproliferation and Arms Control Policy Community

A current example of the role of NN-20 and the benefit provided to the interagency arms control community is the monitoring requirements of prospective further reductions in strategic offensive nuclear arms. Although the START I and START II treaties reduced the number of deployed nuclear warheads, the principal focus of verification in both treaties is the delivery vehicle–heavy bomber, submarine, or ground-based ballistic missile--not the warhead itself. If future treaties call for even lower warhead limits, verification will have to expand to include actual warheads. It is likely that the U.S. will need to monitor the actual number of warheads in stockpiles, and assure itself that warheads removed from stockpiles are being dismantled and their fissile components disposed of safely and securely. These new verification requirements will pose formidable technological challenges.

Whereas delivery vehicles are large and amenable to detection by national technical means, warheads are small and can readily be concealed. A special warhead protocol may be necessary to verify that an object declared to be a nuclear warhead is in fact a nuclear warhead, or an object declared not to be a warhead is not a warhead. Although technologies such as radiation detection can help monitor such a protocol, they must do so without revealing sensitive information about the design of the warhead being examined. The limits of what can be determined about warheads, given this requirement to protect sensitive information, are being explored by NN-20. These studies are being conducted on actual U.S. warheads and associated components to determine the limits of applicability and the difficulties that could be encountered in a prospective warhead dismantlement regime. Simulated treaty inspection regimes have been conducted at the U.S. warhead dismantlement facility using candidate equipment developed in response to requirements set by the U.S. policy community.

The development of innovative equipment under NN-20 funding, and its exercise under simulated treaty conditions, provide the interagency arms control community with "ground truth" regarding what presently can and cannot be done. No other part of the interagency community has the expertise, understanding, equipment, and access to warheads and facilities that the DOE/NN can bring to bear. The information gained from these exercises is critical to today's interagency policy formulation as the U.S. seeks to establish its position with respect to a potential START III Treaty. This research will also help the United States to prepare for other future arms control negotiations, and will identify future research and development requirements for additional progress in this area.

Department of Justice/FBI

The relationship between the Department of Energy and the Federal Bureau of Investigation (FBI) Laboratory is facilitated by a Memorandum of Understanding signed in 1998. A vast array of state-of-the-art material identification technologies and other capabilities exist at the DOE laboratories that are potentially valuable to the FBI. Many of the technologies that NN-20 is pursuing in its Chemical and Biological Nonproliferation program will also be valuable to the FBI.

The basis of a very productive relationship between NN-20 and the FBI is in place. Stable funding for NN-20's work with the FBI is needed to realize the full potential of this relationship.

State and Local Law Enforcement

Several areas of the NN-20 portfolio comprise expertise and technologies of high value to local law enforcement agencies. Among these are sample collection and analysis capabilities, field analysis instrumentation, and laboratory micro-sample analytical capabilities. Virtually all of the multi-purpose DOE national laboratories have material identification technologies superior to those available to local and state authorities.

NN-20's Chemical and Biological Nonproliferation program (CBNP), whose goal is to improve domestic preparedness against the threat of domestic terrorism involving chemical or biological agents, is also highly relevant to local end-users. Part of the program's mission is to develop tools and technologies for "first responders" (fire, police and other local safety personnel). DOE laboratories participating in the CBNP program have made contact with regional representatives. Over the next two years the program will also be conducting several large demonstration projects that will give valuable experience in working with local and state authorities. Technology demonstrations and data collections at an underground station of the Washington, D.C. Metro system, at the new international terminal at San Francisco Airport, and at the 2002 Olympics in Salt Lake City are currently planned.

Currently, the relationship between NN-20 and state and local authorities comes primarily through the Chemical and Biological Nonproliferation program. It appears to be developing well. In the long run the asymmetry between the large numbers of potential local users and the relatively small number of DOE laboratories will need to be addressed.

4: NN-20 Project Selection and Review Processes

Introduction

In this section we discuss the project selection and review processes NN-20 currently uses to ensure the technical quality and mission relevance of its R&D portfolio. We then discuss ways in which these processes can be strengthened.

The quality of the NN-20 R&D portfolio is essential to achieving U.S. nonproliferation and national security goals. The NN-20 R&D portfolio is primarily a mission-driven research and development portfolio, shaped by national policy and end-user needs. Much of the work of the NN-20 R&D portfolio is carried out at the DOE national laboratories.

The portfolio operates over the full range of the research and development spectrum: directed-basic research, applied research, and prototype development. It supports both short-term requests and long-term development. A portion of the portfolio also supports exploratory funding of new ideas that might lead to revolutionary advances in nonproliferation and national security technologies, but this activity has suffered in recent years due to funding constraints.

Although NN-20 is always the primary source of funding for the projects in its R&D portfolio, it is not always the sole source. Some technology projects in the NN-20 portfolio began with DOE Laboratory Directed Research and Development funding, DOE Office of Science support, or funding from a non-DOE source. At the end of the technology development cycle, prospective end-users sometimes contribute partial funding for a prototype, help in kind by providing platforms (e.g., aircraft, space launch), or invite an NN-20 project team to gather data with instruments at a field exercise the end-user is sponsoring.

The current project selection and review processes used by NN-20 to manage its R&D portfolio have evolved as an adaptation to the environment in which the Office operates. It does not currently use a common set of project selection and review processes across the entire portfolio.

Current Selection and Review Procedures

At the request of the Advisory Committee, RAND prepared a summary of current NN-20 selection and review processes. (Reproduced in Appendix E of this report.) In addition, the Advisory Committee had direct discussions with NN-20 officers and individuals at the DOE laboratories about current selection and review procedures.

There are a number of features common to the project selection and review processes of the NN-20 R&D portfolio. Most NN-20 research projects are selected as part of an annual budget planning process involving DOE/NN-20 headquarters and the DOE national laboratories. Each year in response to a memorandum from the Director of NN-20, laboratories submit Project Lifecycle Plans (PLPs) and prioritize proposed new research and development efforts and currently funded projects. (A copy of that memorandum, sometimes referred to as a "call for proposals," is also included in Appendix E.) Each of the PLPs is targeted to one of the four NN-20 program areas and includes a projection of funding needs over the next five fiscal years. Detailed statements of work are provided for each project (proposed and existing), describing its potential contribution to NN-20 R&D program goals, scientific and technical merit, and specific tasks to be accomplished. NN-20 program staff, together with end-users and sometimes outside experts, review the PLPs and make recommendations concerning the selection of new projects and the continuation (or termination) of existing projects. The Director of the NN-20 Office has responsibility for the overall portfolio.

NN-20 also interacts with the policy offices of NN; with DoD, especially the Office of the Secretary of Defense (OSD)/Policy and the Defense Threat Reduction Agency (DTRA); and with other members of the nonproliferation and national security community. These interactions often impact NN-20 R&D planning, sometimes launching efforts in areas where firm requirements do not yet exist but where technology needs to be developed.

All NN-20 projects are required to submit quarterly reports, indicating technical progress to date, problems, milestones and schedules, and costs. These reports are augmented by direct contact between NN-20 staff and the project principal investigators (PIs) and their program managers at the laboratories. These meetings take place 2-3 times per year for all projects and result in status reports of varying degrees of formality. In addition, each project is subject to a formal program review each year, in which the PI makes a structured presentation to the NN-20 staff.

Strengthening Selection and Review Processes

Because its R&D portfolio supports a broad range of activities and serves a diverse set of end-users, NN-20 should not use a single set of project selection and review processes for the entire portfolio. It should, however, apply a set of universal principles. Selection and review processes should be chosen to ensure the highest possible *scientific and technical quality and program relevance*. The particular selection and review processes used for a project should be appropriate to the nature of the project and the program area to which it belongs.

Merit Review

Peer review is a process developed and used extensively in the academic world for basic research. The process is defined by the use of an independent group of experts in the discipline or disciplines encompassed by a proposal. Traditionally the criteria for selection and funding are weighted exclusively on the scientific and technical quality of the work. A modification of peer review, termed "merit review," expands criteria beyond scientific and technical quality to include program relevance.

NN-20 should expand its use of external merit reviews in project selection decisions and subsequent progress reviews, including it wherever feasible in managing its R&D portfolio. For NN-20 the principal criteria should be: (1) scientific and technical quality, and (2) potential contribution to nonproliferation and national security goals. The manner in which a project would be required to demonstrate its contribution to the NN-20 mission should depend on its position on the R&D continuum and the nature of the program areas to which it belongs. Additional criteria drawn from a quality assurance perspective should be added for projects that are more directed or end-user focused.

When selecting new projects for the NN-20 R&D portfolio, merit review would include a solicitation for proposals, evaluation by NN-20 staff members for responsiveness to the solicitation criteria, and, for all proposals that meet solicitation criteria, review by an independent panel of experts. The criteria used to judge merit should include the two principle criteria listed above and appropriate special criteria. The panels, which would meet with the respective NN-20 program manager, would make recommendations to the Director of the Office of Nonproliferation Research and Engineering. For classified projects, the available pool of independent experts will be smaller than for unclassified projects, but merit review panels should always include individuals from outside of NN-20 and the DOE national laboratory community.

The NN-20 Chemical and Biological Nonproliferation program area has adopted merit review for project selection and should continue the practice. The satellite-based sub-area of the Nuclear Explosion Monitoring program area, where the nature of the work is long-term and there are explicit requirements to provide sensor packages matched to the satellite systems interfaces on specific timelines, has long used a merit review process that includes criteria specific to the needs of its end-users; it should continue to do so.

The Proliferation Detection and Proliferation Deterrence program areas of the NN-20 R&D portfolio and the ground-based portion of the Nuclear Explosion Monitoring program area should adopt the merit review approach. Adopting merit review across the entire NN-20 R&D portfolio will pull together good practices already in place, will strengthen practices that are now weak, and will provide a coherent framework for articulating the portfolio to the community inside and outside of DOE, including prospective applicants and end-users.

Laboratory-Level Reviews

Most DOE national laboratories have laboratory-level and directorate/divisional level reviews conducted by outside panels on a regular basis (usually annually). A significant component of these reviews is an assessment of the scientific and technical work being conducted by the laboratory, including NN-20 funded projects. The exact format of these annual reviews, the composition of the panels, and the reports that result differ according to contractual requirements and laboratory policy. Sharing the results of laboratory reviews with NN-20 administration is not done on a formal basis, but informally the NN-20 should be advised about the outcome of these reviews.

DOE headquarters and the DOE laboratories can and should maintain separate domains of accountability. DOE Headquarters should focus its attention on initial project selection, end-user needs, integration of technology and policy, and interagency education. Headquarters should rely more on the science and engineering review processes at the laboratories than it currently does for making judgments about the technical progress of approved projects, provided these reviews are done in a manner that is clearly articulated and include technical experts from outside the laboratory. For multi-laboratory projects, or when significant technical or budgetary problems arise in a previously approved project at a single laboratory, a combination of headquarters and laboratory reviews would be appropriate. Annual reviews of all projects by NN-20 should continue; redundant reviews should be avoided.

Transparency and Documentation

Selection and review procedures should be *transparent, consistent, and documented.* Overall, there is a lack of formality (systematic documentation) in current NN-20 project selection and review processes. Current practices are too highly program area dependent, and there is insufficient tracking and transparency in the management of the NN-20 R&D portfolio. With some key exceptions, it was difficult to find a clear, documented description of the selection and review process used in each individual program area.

The ready availability of comprehensive information on NN-20's project selection and review processes across the portfolio would be useful to DOE laboratory program managers and researchers and to outside researchers who may be interested in collaboration with laboratory scientists or becoming principal investigators on their own right. The specific criteria used in merit review selection processes should be spelled out clearly in all calls for proposals or equivalent documents.

Many NN-20 projects deal with classified technical information, applications, or polices. For these projects, "transparency " and "documentation" will often need to take the form of classified calls for proposals, reports, and reviews. Nevertheless, these classified documents should be available to those who have the necessary clearances and need to know.

Expanding Participation in the NN-20 R&D Portfolio

To be most successful, the NN-20 R&D portfolio must draw upon all the resources of the U.S. science and technology enterprise, while safeguarding classified and other sensitive material and information. At the same time, DOE generally and NN-20 in particular, have responsibility for the stewardship of the technical nonproliferation and national security capabilities of the DOE national laboratories. Balancing these perspectives is a continuing challenge for NN-20.

There needs to be greater opportunity for the wider U.S. scientific and technical community to contribute to the success of the NN-20 portfolio. This can be done through open competition administered by NN-20 as part of its portfolio solicitation process, and through partnerships chosen and managed by the DOE laboratories. Partnerships in the form of consultantships, sub-contracting, sabbatical visits, etc., involving academic researchers and sub-contracting with industry for development and manufacture are well established practices at the laboratories.

DOE laboratories have a history of interaction with the larger U.S. scientific and technical community. Participation of non-DOE personnel in NN-20 projects has been successful. Work that depends on ***unique*** capabilities and facilities of the DOE laboratories should continue to be limited to the DOE national laboratories. Program areas of the NN-20 portfolio that are chosen for open competition should be ones in which high expertise already exists in the academic sector and/or the industrial sector and is applicable to the nonproliferation and national security mission.

Some NN-20 project areas lend themselves to outside participation as a result of the high technical state-of-the-art that exists in the academic or industrial sectors. Project areas that come to mind include seismic verification technologies for low yield underground nuclear tests, and chemical and biological agent detection and identification technologies. Other possible areas are specialized electronic chip development and certain radio-frequency technologies.

Over the course of this review, it became apparent that there are numerous examples of current and recent participation by academe and industry in the NN-20 R&D portfolio, but we are uncertain of the actual numbers. Data demonstrating the frequency and nature of non-DOE laboratory participation in the NN-20 R&D portfolio does not exist in any one place.

NN-20 should document more systematically funding that goes directly to institutions outside of the DOE system as well as funding that goes to the DOE laboratories and then goes out to consultants, subcontractors and collaborators. The documentation should be done in a way that distinguishes substantive scientific and technical involvement from routine purchases of equipment or services.

5: Quality Metrics for NN-20 Projects, Programs, and Personnel

The DOE national laboratories were created as partners to the U.S. Government under contracts documenting that partnership, not as contractors in the ordinary sense. Their continued existence requires that they remain centers of excellence and responsive to national needs. In this section we discuss measures of the quality of the research and technology that results from NN-20 work at the DOE national laboratories, its impact on nonproliferation and national security goals, and the quality of the administrative, scientific, and technical personnel involved.

The Challenge

The diversity of the NN-20 R&D portfolio means that no single set of metrics is suitable for all areas. Metrics used to evaluate the quality of NN-20 programs and projects should be chosen in a manner matched to the activity being evaluated. These activities vary from research in highly specialized areas to large multidisciplinary programs for the development of fully engineered systems to be used in the field. In addition, quality indicators for the personnel associated with the NN-20 need to be chosen appropriately.

NN-20 headquarters and administrators at the DOE laboratory complex who manage funds received from NN-20 should work together to identify metrics that will serve as objective indicators of the quality of the work performed and the impact of that work on nonproliferation and national security goals. Records of quality and impact should be kept and reported on a regular basis. Similarly, indicators of the quality of scientists, engineers and program administrators associated with NN-20 work should be gathered and reported regularly.

Quality Metrics for Programs and Projects

The quality of NN-20 projects and programs and their contributions to nonproliferation and national security goals can be referenced to a set of metrics. The set might include, for example:

- Degree to which the project provides the United States with an important new capability.
- Degree to which innovation is required to execute the project (the need to create new sensors, new chips, new processing algorithms, tamper resistant seals, first-of-a-kind device, etc.).
- Degree to which technical performance is advanced by the project (comparison to state-of-the-art technology in sensitivity, speed, power consumption, weight, or other relevant parameters).
- Technical difficulty of the project (degree to which integration of many disciplines is required, number of project subsystems, unique or stressing operation environment, technical risk, etc.).
- Degree to which the project meets or exceeds the end-user's requirements (cost, schedule, and performance).
- Impact and utility of the project (stimulated further technical advancement, used in a field demonstration, successful transfer to end-user, or deployed operationally).

- Prizes, awards, and other recognition received by the project (R&D 100 Awards, high performance in a field trial, patents, commercialization, etc.).
- Management effectiveness (carrying a project to its defined end point, success in running a complex, multi-project program, etc.).

The above list is illustrative, not comprehensive. Only a subset of metrics would be appropriate to a particular project. Metrics for NN-20 program areas should be a composite of those used for individual projects in the program and supplemented by indicators of the degree to which a program is balanced and addresses the overall goals associated with its sector of the NN-20 mission.

Quality Metrics for Personnel

In collecting data indicative of the quality of scientists, engineers and administrators of NN-20 projects, the data should *not* be restricted to work done only on NN-20 projects. A far better way is to look at the full range of the professional work of an individual.

For individuals working at the basic scientific level, publications, invited talks, and research funds received on a competitive basis can be used (the norm in the academic community), but this will be appropriate for only a small part of the NN-20 enterprise. For individuals engaged in applied research and in development activities, metrics that correspond to success in moving projects forward (and for terminating them when initial expectations prove unjustified!) and for marshalling resources across disciplines effectively are needed. So are metrics that capture effectiveness in assembling and managing multidisciplinary teams to accomplish project objectives, and metrics that measure effectiveness of working with end-users. The quality of classified work is often difficult to evaluate and goes unnoticed because the peer groups are often small and security restrictions must be followed. Nevertheless, those factors do not preclude effective and accurate assessment of the quality of classified work; a good faith effort should always be made.

Quality indicators for individuals should include individual prizes for research, technology, other achievements, and testimonials, where appropriate, from end-users of NN-20 technologies. The selection of an NN-20 scientist, engineer, or manager for service on an interagency group, receipt of funding as a Principal Investigator (PI) or co-PI in a Laboratory Directed Research and Development (LDRD) competition, receipt of a patent, etc., should also be included among the quality indicators. Many awards jointly recognize a project and the personnel behind the project (e.g., R&D 100 and Federal Laboratory Consortium Awards); such awards should be counted in both quality categories.

Reports from laboratory-level and directorate/divisional-level external review committees can also be used as a source of information on the quality of programs, projects, and personnel involved at the DOE national laboratories in the NN-20 enterprise, provided such information can be shared outside the laboratory.

Reporting Information about Quality

Information about the quality of NN-20 programs, projects, or personnel should be reported in summary form once a year to the Advisory Committee. Similar information should be included, as appropriate, when reporting about NN-20 programs, projects, or personnel to higher levels in DOE, to the interagency nonproliferation and national security community, and to the Congress.

NN-20 should make it a goal to be able to report with justification *and* documentation that: (1) the work it conducts supports DOE's mission and U.S. national needs, (2) the quality of the science and technology performed is high, and (3) the work is effectively and efficiently managed.

6: Preserving the DOE Nonproliferation and National Security Tech Base

The fundamental scientific and engineering expertise needed to create and develop advanced nonproliferation and national security technologies resides in many parts of the U.S science and technology enterprise. The Office of Nonproliferation Research and Engineering (NN-20) has the task of engaging this enterprise to meet national requirements. The DOE national laboratories play a special role in this regard. (Here, and throughout this report, we use the term "DOE national laboratories" to refer all DOE laboratories that are officially titled national laboratories as well as DOE facilities that have technical expertise directly related to the nonproliferation mission.)

Role of the DOE National Laboratories

The DOE national laboratories provide two essential capabilities for the DOE Office of Nonproliferation and National Security (NN), and NN-20 in particular. First, the national laboratories are often the best, and in some cases the only, source of the specific technical expertise needed for the NN or NN-20 mission. This is especially true for work in the area of nuclear nonproliferation, which demands intimate familiarity with (classified) aspects of nuclear weapons, knowledge of special nuclear materials, identification of signatures of proliferation, and special instrumentation developed for the U.S. nuclear weapons program. The DOE national laboratories also have broad-based expertise in chemical and biological science that is directly relevant to NN-20's responsibilities in the area of chemical and biological nonproliferation. In addition, the DOE laboratories have great depth in numerous key supporting technologies.

Second, the DOE national laboratories provide a secure environment where large-scale, classified experiments can be conducted and classified prototype instrumentation can be developed and tested. The breadth of the science and technology expertise within the DOE national laboratories means that almost any technical area relevant to nonproliferation and national security is present somewhere in the DOE national laboratory system. A wide range of technical disciplines is required to meet NN-20's mission requirements, e.g., radiation detection, spectroscopy, micro-instrumentation, computationally intensive modeling, and fundamental molecular biology. The existence of these capabilities in the DOE national laboratory system allows complex, multi-disciplinary efforts to be assembled and moved into action quickly and effectively. In addition, many technical experts at the national laboratories have experience in addressing problems from a nonproliferation perspective, and are familiar with the relevant national security issues that must be considered.

Maintaining the NN Tech Base

Maintaining the human expertise in nonproliferation and national security technologies that is present in the DOE national laboratories is essential for the future success of the NN-20 R&D portfolio and U.S. nonproliferation efforts. Success requires a highly competent, enduring, integrated research community that understands the scientific and engineering options, the technical details and signatures of weapons proliferation, the needs of end-users, and, most importantly, the ability to anticipate future needs of the U.S. nonproliferation and national security policy community. We call this collective body of scientific and technical expertise and experience the U.S. Nonproliferation and National Security Technology Base (NN Tech Base).

DOE needs to maintain a comprehensive and high quality NN Tech Base in order to be able to meet its responsibilities. Unfortunately, the NN Tech Base in the DOE national laboratories is shrinking due to recurrent under-funding. The NN-20 R&D budget has remained flat for several years at the same time NN-20 has been assigned additional responsibilities. DOE national laboratory administrators, scientists, and engineers have long expressed concern that the NN Tech Base was endangered, but little or no attention has been paid to their concerns. A one-third reduction in the DOE national laboratories' authority to assess programs to fund Laboratory Directed Research and Development (LDRD) budgets in the current fiscal year will further diminish the NN Tech Base. Current trends need to be reversed.

No single federal agency or office can be the sole guarantor of the NN Tech Base. However, the Office of Nonproliferation Research and Engineering (NN-20) has long been a key shareholder through its support of research and development of technology linked to nonproliferation and national security objectives. NN-20 must remain a key shareholder, but cannot do so without the needed resources.

NN-20 should approach its stewardship responsibilities for the NN Tech Base with a three-element program. First, it must continue to sponsor and administer a high quality, forward-looking core R&D program on technologies for nonproliferation and national security that is responsive to end-user needs. Second, a portion of the NN-20 R&D portfolio should be devoted to "advanced concepts" studies. Third, NN-20 should work to enhance professional interactions and communications between the personnel of the NN Tech Base and the broader U.S. scientific and technical community. The first of these elements has already been addressed in previous sections of this report.

The second element, advanced concepts studies, refers to small, high-risk, but potentially high-payoff projects, typically of one to two years in duration. Such projects explore an idea at the fundamental science level to see if it might form the basis of a revolutionary nonproliferation or national security capability. The origin of an advanced concepts study might be an original idea coming spontaneously from the expert knowledge of a member of the NN Tech Base or it may be the outcome of a discussion between a member of the tech base and an end-user or a policy analyst. Advanced concepts research projects need not necessarily have a definite end-user in mind, but should have the potential of contributing to an NN-20 mission, if the results are favorable.

Advanced concepts funding would give scientists and engineers of the NN Tech Base the opportunity to spend a small fraction of their time conceiving and exploring new ideas that may offer fundamentally new and more capable nonproliferation and national security technologies than those currently available or under development—in other words, the opportunity to be creative in an applied context. Funding for advanced concepts is important in its own right, and it would also help attract the best and the brightest of new generations of scientists and engineers to the NN Tech Base.

An NN-20 budget line named "advanced concepts" was lost in recent years as DOE was required to take on new nonproliferation technology initiatives but was not given corresponding increases in its R&D budget. Moreover, in the past, advanced concept projects were often preceded by a year or two of funding at the laboratory level under a Laboratory Directed Research and Development (LDRD) award, another source of support for the NN Tech Base that is shrinking.

DOE should seek increased funding for NN-20 for the support of advanced concepts research on nonproliferation and national security technologies in future years. This might be done in steps starting at a level of 5% of the NN-20 R&D budget and growing to 10% or more over time. Restoration of such funding in the NN-20 portfolio should be a high priority. Failure to do so will have a deleterious effect on the NN Tech Base and DOE's nonproliferation capabilities will erode.

Erosion of the DOE NN Tech Base will also occur if all NN-20 work is driven by the immediate needs of end-users. Focusing exclusively on immediate needs, as has happened at some federal laboratories, inevitably turns innovative programs, such as those in the NN-20 R&D portfolio into evolutionary programs that ultimately become stagnant, predictable, and produce little of real value.

The third element, enhancing professional interactions and communications between scientists and engineers in the NN Tech Base and the broader community, is important for several reasons. Nonproliferation and national security technologies are often developed in classified environments because they require information about the production and signatures of weapons of mass destruction and their related delivery systems, and because many of the technologies could be rendered impotent if details of their operations were revealed. Nevertheless, to make effective use of developments in the overall scientific and technical community, personnel from the NN Tech Base must maintain contact with the broader scientific community and be active members of their professions: attending national meetings, presenting papers, and discussing their work with colleagues. This is especially true because new ideas often develop at the boundaries between traditional research disciplines.

Clearly, such professional interactions cannot involve classified technologies. However, there is often considerable overlap with the unclassified science base (e.g. the radiation detectors used in unclassified nuclear and high energy physics experiments as well as in uranium and plutonium tracking devices). It is often the application of a given technology or the relationship to an end-user that is classified, not the underlying science. When merited, NN-20 funding can and should support unclassified project work. Professional interchanges and contacts allow scientists and engineers within the DOE national laboratories to stay apprised of the progress of other groups and of the general state-of-the-art in technical areas. Such experiences allow NN Tech Base scientists and engineers to support NN-20 more skillfully and to call upon outside researchers and organizations when needed.

For all these reasons, additional effort should be focused on increasing contact between scientists and engineers of the NN Tech Base and the larger scientific community through mutual seminars, conferences and exchange of scientists, within the limits necessary to protect national security.

The DOE national laboratories are acutely aware of the need to maintain the highly trained and scientifically capable staffs of the NN Tech Base and other tech bases that serve other national needs. As funding at the DOE national laboratories has become less flexible, traditional sources of support for NN Tech Base have been impacted. In response, DOE laboratory administrators have maintained staff and expertise by offering other agencies their services through Work For Others (WFO) funding. While this is beneficial in many ways, as it allows expertise at the DOE national laboratories to be brought to bear on a wide array of national problems, both international and domestic, WFO should not be relied upon to sustain the specialized skills related to nonproliferation and national security that are essential to the NN Tech Base. DOE must remain a strong supporter.

7: The NN-20 R&D Portfolio

In this section we discuss the NN-20 R&D portfolio, its relevance to nonproliferation and national security needs, and its ability to meet NN-20's and DOE's responsibilities. The R&D portfolio is best understood in terms of its four program areas: (1) Nuclear Explosion Monitoring, (2) Proliferation Detection, (3) Proliferation Deterrence, and (4) Chemical and Biological Nonproliferation. The FY 2000 budget for the four program areas and their respective sub-areas is shown in Table 1 at the end of this section.

Nuclear Explosion Monitoring

The Nuclear Explosion Monitoring program area supports strategic U.S. national security objectives. The goal of the NN-20 nuclear explosion monitoring R&D effort is to provide the capability of detecting a nuclear explosion, determining the location and yield of the explosion, characterizing the device, and identifying the responsible party. After nuclear explosion monitoring technologies and systems are developed by NN-20, they are turned over to other U.S. Government agencies for deployment and operation. These technical systems are the *primary* means available to the Unites States to know when and where a state, or possibly a sub-state group, has detonated a nuclear device, whether it be underground, underwater, in the atmosphere, or in space. National security objectives require that the technologies be effective whether a nuclear explosion is declared or conducted evasively.

The Nuclear Explosion Monitoring program area also supports verification of international treaties: the 1963 Limited Test Ban Treaty (LTBT), the 1974 Threshold Test Ban Treaty (TTBT), the 1976 Peaceful Nuclear Explosions Treaty (PNET), and the 1996 Comprehensive Test Ban Treaty (CTBT), which has not been ratified by the U.S.

A nuclear explosion is an event with signatures that do not resemble those of other human activities or naturally occurring phenomena, except possibly at very low yield. The signals available from a nuclear explosion for collection and analysis are well understood. Signal strengths depend upon the yield of the explosion and the medium in which the explosion occurs. As yields decrease to low levels, discrimination (distinguishing a nuclear explosion from a non-nuclear event) becomes more difficult.

The question the United States must answer when making decisions about nuclear explosion monitoring and the verifiability of international nuclear testing treaties is: What is the *lowest yield* the U.S. needs to be able to detect and identify? The answer to that question is ultimately a national security policy judgment based on many factors: an understanding of the technical utility of testing devices with very low yields to a potential proliferator or a party that already has nuclear weapons, the military and political significance of such tests, and the chances of evading detection.

The end of the Cold War brought about a change in the emphasis of U.S. nuclear explosion monitoring. Previously the greatest attention was paid to monitoring nuclear explosions at declared nuclear test sites; in the post-Cold War era the greatest emphasis is on prevention of nuclear proliferation. For nuclear explosion monitoring the change requires global coverage, with particular emphasis on certain regions of the world and on evasively conducted nuclear tests.

Nuclear Explosion Monitoring is the oldest and best-known of the program areas in the NN-20 R&D portfolio. The program is organized into two sub-areas: Ground-Based Systems and Satellite-Based Systems.

Ground-Based Systems

Ground-based nuclear explosion monitoring systems are designed to detect signals generated by explosions in the earth, underwater or in the atmosphere as well as radionuclides generated by a nuclear explosion.

Seismic

NN-20's investments in recent years in seismic detection and analysis systems for underground nuclear explosion monitoring have supported: (i) detailed modeling of the propagation characteristics of regional geological structures in the earth's crust and the propagation of various types of seismic waves (called "phases") through these regional geologies, and (ii) advanced and automated signal processing systems. The first leverages the large international seismology scientific community that collectively operates a global network of instruments and exchanges data openly on naturally occurring seismic events (earthquakes, large to very small). The second leverages the ongoing revolution in computer and signal processing capabilities.

Major improvements have been steadily made over the last several decades in seismic detection technology for nuclear explosion monitoring, due in large part to NN-20 funding. The prospects for continued advances in capabilities are high. It is appropriate that seismic technology is continuing to receive the largest share of the budget for the Ground-Based Systems sub-area of the NN-20 R&D portfolio.

Radionuclide

Radionuclide detection and analysis is the second largest sub-area of NN-20's R&D investments in ground-based nuclear explosion monitoring technology. This sector, which also has a long history, traditionally dealt only with the detection of fallout (radioactive particulate matter) from nuclear explosions on the earth's surface or in the atmosphere—the "smoking gun" of a nuclear event. NN-20 R&D support in recent years has led to dramatic improvements in fallout detector capability (higher sensitivity, autonomous operation for a month or more, and self-reporting of data and system status). NN-20 funding in recent years has led to an entirely new class of radionuclide detectors. These latter systems detect four distinct radioactive isotopes of the inert gas xenon after cryogenic separation from atmospheric samples and by such means can discriminate between radio-xenon from nuclear explosions and that from nuclear reactors. All nuclear explosions release radio-xenon: it readily escapes into the atmosphere from nuclear explosions conducted on the earth's surface or in the atmosphere. Underground nuclear explosions may be also be detectable by radio-xenon means if the explosions are set off in media with fissures and other escape paths.

The NN-20 sponsored particulate detection system has already been commercialized, and the radio-xenon system is in the process of commercialization. NN-20's investments in radionuclide detection technologies have advanced U.S. capabilities substantially.

Hydroacoustic

Hydroacoustic detection systems make use of sensors that remotely detect underwater explosions (nuclear or conventional) by identifying the characteristic underwater acoustic disturbances that propagate outward from an explosion. Only a relative few sites are needed to monitor vast oceanic regions because low frequency sound readily travels long distances in the ocean sound channel. Hydroacoustic signals can be detected in-situ by underwater microphones (hydrophones), or on land by placing special purpose seismic detectors on small islands (where available). In the latter case, the underwater acoustic disturbances "shake" the island and generate seismic signals that are readily detectable. (Volcanic islands reaching up from the deep ocean are ideal.) Modest investments in developing hydroacoustic technology are important because the technology closes what otherwise would be a loophole, given that most of the earth's surface is water.

Hydroacoustic nuclear explosion monitoring technology leverages an existing vast body of sensors, propagation models, and expertise coming from submarine detection experience, oceanographic research, and commercial computing and signal processing capabilities. NN-20 investments in this sub-area are appropriate in scope and funding.

Infrasound

Infrasound explosion detection systems pick up acoustic signals in the atmosphere at frequencies far below the audible range. At such frequencies attenuation is so low that acoustic signals from a surface or low-altitude atmospheric nuclear explosion can be detected at intercontinental distances. The basic technology of infrasound is relatively inexpensive (microphones with high sensitivity at frequencies of 0.1-20 hertz and signal processors less complicated than the ordinary laptop computer). Infrasound mainly serves as a backup to radionuclide and space-based systems (discussed next), but because the technology is inexpensive and can be exported without technology transfer concerns, infrasound merits the limited investment NN-20 is making in this sub-area.

Satellite-Based Systems

Satellite-based sensors for detecting nuclear explosions on the earth's surface, in the atmosphere and above the atmosphere have long been established elements of U.S. national technical means (NTM). In the earliest days (1960s) dedicated satellites were used. For over three decades now, nuclear detonation detection system (NDS) packages have been flown piggy-back on satellites serving other missions. This occurred first on the early-warning Defense Support Program (DSP) satellites and later on the satellites of the Global Positioning System (GPS).

NN-20 has the prime responsibility for sustaining and advancing the entire suite of technologies that can be used for detecting nuclear explosions from space. Existing sensors include optical radiometers (bhangmeters) that detect the characteristic optical flash the comes from a nuclear explosion in the atmosphere up to medium altitudes; x-ray detectors and radio-frequency electromagnetic pulse (EMP) sensors for high attitude nuclear explosions; and neutron and gamma ray detectors for explosions above the sensible atmosphere.

Each new generation of DSP or GPS satellites brings changes in subsystem interfaces, data telemetry formats, and power and weight restrictions on payloads. The changes require NN-20 to go through a complete redesign of the NDS package, including demonstration and validation. Typically, DOE also takes advantage of these opportunities to introduce upgrades to sensors and sometimes add new sensors, enhance on-board processing and memory, and add other improvements to meet end-user needs. This responsibility is a major one and NN-20's record of accomplishment is outstanding. NDS packages are usually designed for a five-year lifetime, but typically continue to perform well beyond that, usually until the satellite is shut down. The unique knowledge and expertise that underpins the spaced-based nuclear explosion detection technology is a core component of the NN Tech Base discussed in the previous section.

Some of the recent R&D initiatives for improved satellite-based nuclear detection systems were motivated in part by the prospects for a CTBT. However, all of these space-based systems have always been and will continue to be part of U.S. NTM. Data collected from these systems are not shared internationally. The next round of NDS improvements that is slated for deployment represent significant improvements in sensitivity and localization and will provide valuable information to the U.S., independent of the CTBT.

Proliferation Detection

Proliferation Detection is the second largest program area of the NN-20 R&D portfolio. It is devoted to the identification of signatures of nuclear proliferation prior to a nuclear explosion and to sensors to detect such signatures remotely with instruments on satellites, airborne platforms, or possibly ground-based. The desire for such a capability has existed as long as nuclear weapons have existed, but only in the last decade or so have opportunities become available to pursue a significant R&D program. Several of the technologies being pursued by NN-20 in this program area may also be useful for detecting signatures of chemical and biological weapons proliferation.

The Proliferation Detection program area is divided into two broad sub-areas: Physical Detection and Effluent Detection. The first encompasses, in principle, all passive and active means (optical, infrared, radar, radio-frequency, etc.) that might be used to obtain information about a building, nuclear reactor, facility, neighborhood of a facility, piece of equipment, etc., indicative of a nuclear weapons program. The second sub-area encompasses those technologies that are particularly suited to detection and identification of gases and particulates that might be released from a nuclear-related facility on a continuous or intermittent basis, e.g., chemical releases from a putative plutonium reprocessing plant, or from a uranium enrichment facility. Both cooperative and non-cooperative scenarios are considered in each of the sub-areas.

Although the potential scope of this program area is vast, the funding limitations and the technological challenges of proliferation detection are such that NN-20 can support only a limited set of projects. Three of the technology development projects in this program area are large, multi-year, multi-laboratory efforts: Multispectral Thermal Imager (MTI), Hyperspectral Infrared Imaging Spectrometer (HIRIS), and Chemical Analysis by Laser Interrogation of Proliferation Effluents (CALIOPE). The first of these belongs to the Physical Detection sub-area, and the last two to the Effluent Detection sub-area. All three projects push the technological envelope and should be viewed as high-risk but potentially high-payoff investments. Such investments are necessary if the U.S. is to improve its nonproliferation capabilities. The challenge for NN-20 is to ensure that the technologies are of high quality and, if successful, will contribute to achieving national security objectives.

Physical Detection

The principal project of the physical detection program sub-area is the Multispectral Thermal Imager. Other projects in this sub-area are smaller, different in character, and have distinct proliferation detection applications.

Multispectral Thermal Imager

The Multispectral Thermal Imager (MTI) project is an integrated research satellite-sensor project that was started in late 1993 and is scheduled to be launched in early 2000 by the United States Air Force (USAF) under its competitive Air Force Space Test Program (free to DOE). The passive sensor has 15 spectral bands distributed over the wavelength interval 0.45 - 10.7 μm. Ground resolution varies with wave-band, ranging from 5 m at the shortest wavelengths to 20 m at the longest. MTI is designed for high absolute radiometric accuracy, rather than only measuring temperature differences. High accuracy absolute temperature measurements from space have not previously been feasible; this project represents a significant technical advance.

MTI is designed to operate for three years in orbit (at least through 2003), during which time vast amounts of data will be gathered. Much of it will be shared with members of the MTI Users Group, which includes individuals from DOE, other federal agencies, industry and the academic community. MTI is the largest project ever mounted by NN-20 or its predecessor organizations and has gone through numerous technical reviews and milestone evaluations.

MTI is a grand experiment designed to determine, through careful and systematic study, what can be observed from space that is applicable to the proliferation detection mission using a state-of-the-art, well-calibrated multispectral sensor. MTI is not a prototype instrument on a path to an end-user. MTI will undoubtedly also provide valuable information to other missions. The next research stage after MTI will depend on the quality and utility of the data it produces and the joint interests of NN-20 and its many partners in the project. It is too early now to judge the ultimate utility to the nonproliferation mission of space-based, high radiometric accuracy, multispectral thermal imagers.

Other Projects

The Physical Detection sub-area contains a number of other projects, smaller in funding than MTI, but no less important. The main ones are: synthetic aperture radar (SAR) algorithm and processing development, radio-frequency (RF) sensing and processing, and remote ultra-low-light imaging (RULLI) technology. SAR is a well established multi-purpose technology and has been an outstanding NN-20 investment for many years: the potential for further progress remains high. The RF technology and processing project is low risk and aimed at special purpose applications. RULLI is an original contribution developed under NN-20 sponsorship and has moved from the high-risk to the moderate-risk category.

Effluent Detection

Projects in this sub-area are focused on detection and identification of effluents indicative of nuclear proliferation activities. Success depends on a comprehensive knowledge of potential effluents, their behavior in the environment, and ability to detect and identify chemical species of concern. The technology may also support detection of chemical and biological weapons proliferation, or their use.

Hyperspectral Infrared Imaging Spectrometer

The Hyperspectral Infrared Imaging Spectrometer (HIRIS) is a passive infrared sensor operating in the 8-13 μm infrared region with vastly more bands than MTI (hence hyperspectral). The HIRIS instrument lacks the very high absolute radiometric accuracy of MTI but has greater spatial and spectral resolution. Note, however, the primary reason for the greater spatial resolution is that HIRIS is airborne rather than satellite-based. The narrow width of the individual bands of the HIRIS instrument combined, with its large number of bands, makes the discrimination of vast numbers of chemical species possible, providing the signal-to-noise ratio is adequate. The intended targets of HIRIS are effluent emissions characteristic of nuclear proliferation activities, e.g., releases from a plutonium reprocessing facility.

The basic nature of the HIRIS instrumentation and its planned applications mandates a much greater data processing capability than is required for the MTI system. Consequently, data processing and algorithm development are major components of the HIRIS project.

HIRIS, like MTI, is a large experiment centered around a state-of-the-art sensor that, beginning in a year's time, is scheduled to take large amounts of field data under a variety of conditions. HIRIS also has many interagency partners and potentially many applications. Proof-of-principle and test flights took place in 1998 and 1999, with real-world data collection scheduled for 2000-2002 and project completion in 2003. HIRIS is no less a grand experiment than MTI, except that it enjoys the relative simplicity of being airborne, which allows evolutionary development in contrast to the unforgiving character of space-based systems.

Lidar Systems

In 1993, NN-20 initiated a multi-laboratory program comprised of a suite of active lidar (laser radar) remote sensing instruments under the collective title Chemical Analysis by Laser Interrogation of Proliferation Effluents (CALIOPE). Since that time the technical content of the program has evolved and significant advances have been made in understanding and improving the technology. Annual field trials have been held at a calibrated effluent release facility at the Nevada Test Site since 1994 at increasing ranges, up to 20 km in some cases. The program is now focused on two projects: (1) an ultraviolet, laser-induced fluorescence (UV-LIF) instrument for detecting particulates on the ground; and (2) a differential absorption lidar (DIAL) infrared instrument to detect gaseous effluents. Active systems have specific advantages over passive systems, such as greater sensitivity in general, but they are more complex, require more power, and are intrusive.

The technical basis of the UV-LIF molecular identification is electronic excitation by an incident UV photon of the proper frequency and then subsequent detection of a photon emitted by the molecule as it decays from the excited state (fluoresces). By tuning the incident UV radiation over a range of frequencies and measuring the frequencies of the fluorescent returns, one can identify molecules of interest and discriminate against backgrounds.

The DIAL system works by tuning across a range of frequencies that cover the spectral features of molecules of interest. By comparing on- and off-resonance return strengths, a high selectivity for individual chemical species is possible.

The UV-LIF sensor is scheduled to be mounted on a high-altitude Altus UAV (unmanned airborne vehicle) owned by DOE. Engineering flights are scheduled for late 2000 and full-system experimental flights are scheduled to start in late 2001. Depending on results and the potential for enhancing proliferation detection capabilities, the project is likely to evolve into a combined active UV-LIF/passive IR system. The basic idea of the combined system would be that the passive IR system would be used to do a wide area search to identify local regions of interest by means of thermal characteristics. The lidar would then be used to look for chemical species indicative of specific effluents in the local regions (small search area). The Defense Threat Reduction Agency (DTRA) is interested in this project because of its potential for chemical and biological agent identification in DoD missions.

The DIAL system is also scheduled for significant development and ground trials over the next two years. The goal is an engineering prototype suitable for basing on an airborne platform. A combined active DIAL/passive IR prototype system by 2003 is envisioned as a joint DOE-DoD effort. The logic of using a combined passive-active system here is the same as for the UV-LIF/passive IR system.

The next few years will be important in demonstrating the field performance of these active lidar systems and their potential for detecting effluents characteristic of proliferation. Maximum stand-off distances, minimum sensitivities, probabilities of detection, and false-alarm rates are all of interest. It not possible at this time to predict the ultimate capabilities and utility of this technology.

Signatures of Proliferation

There is currently no project in the NN-20 portfolio explicitly directed to advancing current understanding of the signatures of nuclear proliferation. NN-20 has sponsored work on signatures in the past. NN-20 should have ongoing work in signature analysis and confirmation to refine current understandings of the robustness and strengths of signatures, possible backgrounds, and to prioritize those that appear to be the most promising. Without such a program there is no meaningful way to determine when a proliferation detection sensor technology, no matter how much it has advanced the start-of-the art, has reached the point at which meaningful operational system studies can be undertaken.

Proliferation Deterrence

The Proliferation Deterrence program of the NN-20 R&D portfolio has a history reaching back to the early days of Los Alamos. The content and emphasis of the program area has evolved greatly over the many decades of its existence. Proliferation Deterrence is the "clean-up" hitter of the NN-20 R&D portfolio and fulfills many critically important national needs. It can respond on short time-scales, when events dictate, and it has enduring responsibilities.

The primary sub-areas of Proliferation Deterrence are: Treaties and Agreements, Nuclear Material Tracking and Control, Off-Site Analysis, On-Site Analysis, and Support for Law Enforcement.

Treaties and Agreements

Treaties and agreements for which this program sub-area has provided technical support in the past include: Intermediate Nuclear Forces Treaty (INF), Chemical Weapons Convention (CWC), START I and II, International Safeguards, and the Highly Enriched Uranium (HEU) Purchase Agreement. Possible future treaties and agreements that will benefit from the knowledge and technical expertise of the members of this part of the NN Tech Base include START III, the Fissile Material Cutoff Treaty, the Mayak Fissile Material Storage Facility Transparency Agreement, and the Plutonium Production Reactor Agreement.

Members of this program sub-area work closely with members of the Office of Arms Control and Nonproliferation (NN-40) and provide support for the DTRA under terms of an integrated DoD/DOE plan. The work relates to DoD responsibilities in the areas of Cooperative Threat Reduction and On-Site Inspection.

Monitoring challenges that must be solved include detecting the presence or absence of fissile material by non-invasive means, the isotopic ratios and ages of plutonium samples, and devising systems with robust information barriers that will perform a gamma-ray spectral analysis of a warhead to verify that it is or is not a nuclear weapon without revealing classified design information.

Nuclear Material Tracking and Control

This program sub-area is primarily concerned with developing advanced gamma-ray and neutron detector systems for detecting, localizing, and characterizing the presence or transit of nuclear material. The technical contributions of this program sub-area are also centrally important to the task of enhancing the tools available for managing real nuclear terrorist incidents or hoaxes.

Recent creative contributions of this program sub-area include compact, field-portable gamma-ray spectrometers based on new types of scintillation crystals for identifying the unique radiological characteristics of fissile materials and nuclear weapons, and novel radiation "litmus" paper that changes color when exposed to a threshold radiation dose.

Off-Site Analysis

The fundamental difference between technologies belonging to this sub-area and those discussed above in the Proliferation Detection program area is that here it is assumed that a physical sample (solid, liquid, or gas) is available and can be transported to a state-of-the-art laboratory for analysis. The physical, chemical, biological and interdisciplinary resources of the entire DOE laboratory complex can thus be exploited.

Eleven DOE laboratories are the primary participants, and collectively they bring a vast array of analytical tools and systems to bear. Most recently, ultra-sensitive detection and analysis technologies that enable information to be extracted from microsamples have made striking advances. The primary emphasis is nuclear proliferation, but the research and technology also contributes to chemical agent identification. The potential for further progress in this sub-area is great, with contributions coming from DOE laboratories, industry, and universities.

On-Site Analysis

This program sub-area is similar to Off-Site Analysis except that here the assumption is that samples are available but, for whatever reasons, cannot be transported from the collection site to a specialized laboratory. The sub-area supports on-site treaty inspectors, transparency exercises, counter-nuclear smuggling, and specialized intelligence and law enforcement needs.

Similar to its off-site counterpart, this sub-area is multidisciplinary and multi-laboratory. Compact gas chromatographs, ultra-sensitive effluent "sniffers," miniature mass spectrometers, and a host of other chemical and physical detection and sensing technologies are being developed as field-portable devices. There is a synergy between the miniaturization that is taking place with respect to laboratory systems off-site and what is needed for on-site analysis systems.

Support for Law Enforcement

This sub-area is the newest component of the Proliferation Deterrence program area. It is based on a Memorandum of Understanding between DOE and the Department of Justice/FBI Laboratory. The MOU allows for broad areas of cooperation, extending well beyond domestic nuclear terrorism. The off- and on-site detection and analysis capabilities discussed above have numerous applications to law enforcement, as do numerous other technical capabilities resident in the DOE laboratory system.

Chemical and Biological Nonproliferation

Chemical and Biological Nonproliferation is the newest program area of the NN-20 portfolio. It was created in FY1997 in response to Presidential and Congressional direction. The program is devoted to developing, demonstrating, and delivering technologies and systems that will lead to major improvements in the U.S. capability to prepare for and respond to domestic chemical and biological attacks. It engages the expertise in chemical and biological sciences resident in the DOE laboratories, and is part of the overall U.S. response to the chemical and biological weapons threat. The same DOE science and technology base that supports this program area is being tapped by other federal agencies under "Work For Others" agreements.

A five-year Strategic Plan (FY00-FY04) for the Chemical and Biological Nonproliferation program area was developed in 1999. It specifies specific goals and milestones and divides the program area into two major sub-areas: (1) Technology Development and (2) System Integration/Domestic Demonstration and Application Program. The program has included end-users in its planning process since its conception.

Technology Development

The Technology Development program sub-area is comprised of four project areas: Biological Foundations, Chemical and Biological Detection, Modeling and Predictions, and Decontamination and Restoration.

Biological Foundations

The goal of this project area is, "To provide essential biological information for medical countermeasures." Work is organized under seven technical areas: signature development and validation, engineered organism detection, background characterization, genomic sequencing, structure/function determination, epidemiology tools, and infomatics. Spin-offs to the DoD's Biological Weapons Threat Reduction effort and to the disease monitoring efforts of the public health community are likely.

Chemical and Biological Detection

The goal of this project area is, "To provide early warning, identify people to treat, and identify contaminated areas with high sensitivity and low false alarm rates." To fulfill the goals of this project area, a suite of detectors and sensors are being planned for use by first responders (law enforcement officials, fire fighters, and emergency medical service personnel). Several classes of urban targets characterized by large concentrations of people are being considered, e.g., subways, airports, train stations, and large sporting events. Detection technology for first responders must be simple, portable, low-cost, and provide a fast response—a challenging set of requirements. Additional technologies are being developed for expert forensic analysis of samples brought to a laboratory setting. These systems need be highly sensitive, represent or exceed state-of-the-art capabilities, and be able to detect threatening agents in the presence of contaminants—the usual state of samples taken in real-world environments. Advanced forensic capability is needed to distinguish between natural and unnatural outbreaks of diseases and to provide positive identification of the agent or agents involved. DNA information can sometimes be used to identify particular strains that, in the case of biological agents, may reveal the geographic location of the source.

Modeling and Predictions

The goal of this project area is "To develop predictive modeling tools for urban environments inside and outside of facilities." Major tasks include: developing a suite of validated multi-scale transport and fate models for chemical and biological agent releases; applying modeling capabilities to simulation case studies; integrating the modeling capabilities in the National Atmospheric Release Advisory Center (NARAC); and exercising the models in the PROTECT (subways, airports, and train stations) and BASIS (Salt Lake City Olympics) demonstration projects.

Decontamination and Restoration

The goal of this project area is "To quickly restore civilian facilities." Restoration is important because untreated facilities may remain contaminated for decades. Decontamination and restoration present many challenges, some technical and others practical. Among these are the development of decontaminant formulations that can destroy or detoxify hazardous chemicals or biological pathogens while remaining harmless to people and property. A formulation that is effective for all chemical and biological agents would be particularly useful. Application methods for interior and exterior environments have to be identified. In addition, reliable sampling methods need to be developed to monitor the decontamination process as it proceeds and to measure the extent of residual contamination. The variety of surface materials present in the urban environment make this a difficult problem. Although decontamination and restoration may not be considered as glamorous as work at the fundamental science level, they are important to achieving the goals of the Chemical and Biological Nonproliferation program.

System Analysis and Integration

In addition to technology development, DOE has accepted the challenge of working with state and local safety and law enforcement officials to develop an integrated approach to domestic chemical and biological weapons terrorism. This requires practice and experience at the operational level. This area of work consists of two parts: (1) an umbrella project called PROTECT, a systems approach to the interior infrastructure problem; and (2) BASIS, a special events protection demonstration scheduled for the 2002 Salt Lake City Olympics.

PROTECT currently includes plans for aerosol dispersal studies after hours in the Washington DC Metro System, air flow and detector architecture studies at the International Terminal of San Francisco Airport, and studies at Boston South Station. BASIS will emphasize multi-site communications and sensor information exchange.

The NN-20 Chemical and Biological Nonproliferation program is off to an excellent start on an important, timely, and challenging mission. Its Strategic Plan provides a coherent framework for program administration, identifying needs, setting priorities, and assessing progress. The program brings NN-20 into contact with a unique and diverse set of end-users—first responders at the state and local levels—and at the same time the program must interface with multiple federal agencies. The potential contributions of the NN-20 Chemical and Biological Nonproliferation program to national needs are great. As program funding grows, as it must to meet its assigned goals, it is important that funding for the other program areas of the NN-20 R&D portfolio is not sacrificed. The threat of nuclear proliferation is increasing and effective nuclear nonproliferation technologies need continued support.

Summary

Each of the four program areas of the NN-20 R&D portfolio addresses U.S. nonproliferation and national security objectives in a manner consistent with Executive and Congressional mandates. The technical quality of the work in each program area is high. There is a clear correspondence between the four NN-20 R&D program areas and three "elements" of the *DOE National Security R&D Portfolio*: NN-20's Nuclear Explosion Monitoring program area maps onto *Monitoring Nuclear Treaties and Agreements*; the Proliferation Detection program area maps onto *Detecting Proliferation*; the Chemical and Biological Nonproliferation program area maps onto *Countering WMD Terrorism*; and the Proliferation Deterrence program area maps in part onto *Monitoring Nuclear Treaties and Agreements* and mostly onto *Countering WMD Terrorism*. The need for continuing R&D in all four program areas remains high because the threat posed by proliferation of weapons of mass destruction shows no sign of decreasing.

The Nuclear Explosion Monitoring program area has work remaining to bring technologies and data analysis systems already at an advanced level to the point where they can be transitioned to an end-user. In addition, there is a need for continued fundamental work to enhance nuclear explosion monitoring capabilities for low yields, especially work related to nuclear tests conducted evasively. The Proliferation Detection program area has three large, multi-year remote-sensing projects (MTI, HIRIS, and CALIOPE) that will be reaching experimental maturity and collecting significant data in field tests in three or less years. For each, a major decision will need to be made in a timely manner to determine if the potential utility of the technology merits going to the next stage of prototype development. The Proliferation Deterrence program area will continue to be essential to support treaties and agreements that require verification of a wide range of activities including: dismantlement of nuclear warheads, fissile material production cutoffs, tracking and control of nuclear materials, and safe and secure disposition of highly enriched uranium and weapons-grade plutonium. The Chemical and Biological Nonproliferation program area is just completing the first year of its five-year strategic plan.

NN-20 should proactively define and communicate a five-year plan for its R&D portfolio that balances end-user needs and opportunities for new research initiatives. Because of pressing end-user needs, a large fraction of the current NN-20 R&D portfolio is focussed on short-term technology development. In order to stay abreast of technological advances and to insure that opportunities for new capabilities are not missed, a larger share of the NN-20 R&D portfolio should go to new research areas than is currently the case. Unless the pattern of end-users need changes, this will require additional funding beyond the new advanced concepts funding discussed earlier in this report.

Table 1: FY 2000 NN-20 Budget

Nuclear Explosion Monitoring			**$73M**
Ground-Based Systems (R&D)		$23M	
	Seismic		
	Radionuclide		
	Hydroacoustic		
	Infrasound		
Satellite-Based Systems (R&D)		$13M	
Satellite-Based Systems (Production Related)		$37M	
Proliferation Detection			**$66M**
Physical Detection		$25M	
	Multispectral Thermal Imaging		
	Synthetic Aperture Radar		
	RF Sensors		
	Low Light & Laser Assisted Imaging		
Effluent Detection		$41M	
	Hyperspectral Imaging Spectrometer		
	Lidar Systems (CALIOPE)		
Proliferation Deterrence			**$35M**
Treaties and Agreements		$ 4M	
Nuclear Material Tracking and Control		$ 9M	
Off-Site Analysis		$ 9M	
On-Site Analysis		$ 8M	
Support to Law Enforcement		$ 5M	
Chemical/Biological Nonproliferation			**$40M**
Biological Foundations		$11M	
Chemical and Biological Detection		$13M	
Modeling and Prediction		$ 5M	
Decontamination and Restoration		$ 2M	
Systems Analysis and Integration		$ 9M	
Small Business Innovation Research			**$ 5M**
TOTAL			**$219M**

APPENDICES TO THE REPORT:

DOE Research and Technology Against the Threat of Weapons of Mass Destruction

Review of the Department of Energy Office of Nonproliferation Research and Engineering (NN-20)

Department of Energy
Nonproliferation and National Security
Advisory Committee

February 25, 2000

APPENDIX A:

Nonproliferation and National Security Advisory Committee Charter

U.S. DEPARTMENT OF ENERGY
CHARTER
NONPROLIFERATION AND NATIONAL SECURITY ADVISORY COMMITTEE

1. Committee's Official Designation:
   Nonproliferation and National Security Advisory Committee

2. Committee's Objectives and Scope of Activities and Duties:

   The activities of the Nonproliferation and National Security Advisory Committee include:

   a. The Committee will evaluate and recommend alternative technical approaches for the Office of Nonproliferation and National Security (NN) research and development programs based upon periodic technical reviews of program progress and plans.

   b. The Committee will provide advice on long-range plans, priorities, and strategies to address more effectively the technical aspects of the nonproliferation research and development program and opportunities for cooperation with external organizations.

   c. The Committee will provide advice on the technical aspects of the overall Office of Nonproliferation and National Security program, including, for example, arms control or safeguards and security.

   d. The Committee will provide advice on the existing linkage and future impact of changes in national policy on technical aspects of NN research objectives of concern to the Department of Energy, as requested by the Secretary of Energy or Assistant Secretary for Nonproliferation and National Security.

3. Time Period Necessary for the Committee to Carry Out the Purpose:
   In view of the goals and purposes of the Committee, it is expected to be functional for two (2) years.

4. Official to Whom this Committee Reports:
   The Committee will report to the Assistant Secretary for Nonproliferation and National Security.

5. Agency Responsible for Providing Necessary Support for this Committee:
   The Department of Energy will provide all necessary support for the Committee. Within the Department, primary support shall be furnished by the Office of Research and Development (NN-20).

6. Description of Duties for Which the Committee is Responsible:
   The duties of the Committee are solely advisory and are stated in paragraph 2, above.

7. Estimate Annual Cost:
   $100,000; one-quarter person-years.

8. Estimated Number and Frequency of Meetings:
   The Committee will meet periodically, approximately three times per year.

9. Committee's Termination Date (if less than two years for date of establishment):
   Not Applicable.

10. Subcommittee(s):
    To facilitate the functioning of the Nonproliferation and National Security Advisory Committee, subcommittees may be formed. The objective of a subcommittee is to make recommendations to the parent committee with respect to particular matters related to the responsibilities of the parent committee.

11. Members:
    Committee Members shall be appointed by the Secretary of Energy.
    Approximate number of committee members will be 15.

12. Chairperson:
    The Chairperson shall be appointed by the Secretary of Energy.

This Charter for the Nonproliferation and National Security Advisory Committee name above is hereby approved on:

____
Date

____
James N. Solit
Advisory Committee Management Officer

____
Date Filed

APPENDIX B:

Charge to the
Nonproliferation and National Security Advisory Committee

Department of Energy
Washington, DC 20585

August 17, 1999

Dr. Jeremiah Sullivan, Chair
Nonproliferation and National Security Advisory Committee
University of Illinois
237C Loomis Laboratory of Physics
1110 West Green St.
Urbana, IL 61801

Dear Dr. Sullivan,

First, I want to thank you for accepting the Chair of the Nonproliferation and National Security Advisory Committee (NNAC). I look forward to working with you and receiving your insight and advice on technology programs and related issues throughout the Office of Nonproliferation and National Security.

As you know, the Department of Energy sponsors extensive research and development programs in nonproliferation and national security. The majority of this work is funded by the Office of Research and Development (NN-20) in the Office of Nonproliferation and National Security and is conducted at the DOE national laboratories. The goal of the NN-20 program is to develop technologies and systems for monitoring nuclear treaties and agreements, detecting and preventing the proliferation of weapons of mass destruction (WMD), and countering terrorist use of nuclear, chemical, and biological WMD. These programs are focused on advancing applied technologies to the prototype stage, drawing on applied and basic research. Implementation of these technologies is jointly planned with national security technology end-users at other agencies.

The NN-20 FY99 total budget was $210M, with $77M allocated to monitoring nuclear test treaties and agreements, $67M for detecting WMD proliferation, $60M for countering WMD proliferation. During the FY99 budget process, Congress directed the Department to initiate an external review of the nonproliferation and national security research and development program. Specifically, Congressional language in the FY99 House Energy and Water Development Appropriations Committee Report stated:

> "The nonproliferation and verification research and development program consists of hundreds of projects executed primarily at the nuclear weapons laboratories. The value of these disparate projects is difficult to ascertain as there does not appear to be an overriding program plan or technology roadmap which identifies how the individual projects contribute to the overall objectives. An external, peer-review process to examine each of the projects, their progress, and

> their value to the overall needs of the program would lend credibility to this effort."

This language was reaffirmed in the Conference Report 105-749, which stated, that "[t]he conferees direct the Department to initiate an external review of the projects being conducted, their progress to date, and their value to the overall needs of the program."

The FY00 budget request is $215M, with $74M allocated to monitoring nuclear test treaties and agreements, $68M for detecting WMD proliferation, $70M for countering WMD proliferation. The House Energy and Water Development Appropriates Conference Report contains additional language regarding the NN-20 programs.

> "The nonproliferation and verification research and development program consists of hundreds of projects executed primarily at the nuclear weapons laboratories. The Department has still provided no information to the Committee that shows the value of these disparate projects, and how they relate to an overriding program plan or technology roadmap. The Department should provide a report to the Committee by October 31, 1999, which identifies how the individual projects contribute to the overall objectives. The Department should also implement an external, peer-review process to examine each of the projects, their progress, and their value to the overall needs of the program."

As a first charge to the NNAC, I would like the committee to review the programs and overall strategy of the research and development programs in NN-20 to address the FY99 and FY00 Congressional language. In order to assist the NNAC is this task, we have contracted with RAND's National Defense Research Institute (NDRI) to apply its Strategies-to-Tasks methodology to identify the linkage between national missions and the projects in the NN-20 research program. I would like the NNAC to assess and provide recommendations to me and the NN-20 staff on the:

- Ability of the NN-20 programs to identify and address national security objectives
- Technical quality of research conducted at the DOE national laboratories under NN-20 sponsorship
- Ability of the NN-20 to identify critical technology requirements of the technology end-users in DOE and other agencies/departments and to execute tasks needed to meet these requirements.
- Effectiveness of DOE's ability to transfer technologies to technology end-users
- Flexibility of the research and development programs to respond to rapidly changing national security missions and requirements
- Balance of work and budgets across the NN-20 programs

I plan to submit an interim reply to Congress by the end of September 1999, on the status of the NNAC review of the NN-20 programs. The final report of the NNAC should be submitted to me by January 15, 2000, in order that it may provided it along with other materials to Congress with the FY01 Budget submittals.

I appreciate your and the NNAC's willingness to take on these important activities. I know that my Office will benefit tremendously from your insight and advice. I look forward to working with you and learning of your progress during this review.

Sincerely,

Kenneth E. Baker

for Rose Gottemoeller
Assistant Secretary for
Office of Nonproliferation
and National Security

APPENDIX C:

NN-20 Policy Guidance

CONTENTS

TABLES

NN-20 Policy Guidance

This paper, prepared by RAND staff at the request of the Nonproliferation and National Security Advisory Committee (NNAC), identifies and summarizes official U.S. government policy documents--statements of national policy or national need, public laws, relevant treaties and agreements, assignments of responsibilities among Federal agencies, and the like--that bear on the mission and programs of the Department of Energy's Office of Nonproliferation Research and Engineering (DOE/NN-20). The discussion is organized by NN-20 program area. It concludes with a brief survey of examinations of the government's R&D for nonproliferation carried out by the Congressional Research Service, the General Accounting Office, and the Congressional Budget Office.

I. GENERAL POLICY GUIDANCE

Several sets of policy documents provide guidance and/or authoritative justification for NN-20 activities as a whole, cutting across individual programs. First and most fundamentally, the Atomic Energy Act of 1954 (as amended) provided *inter alia* for private participation in research, development, and production of atomic energy and nuclear materials; the Atomic Energy Commission was responsible for the licensing and regulation of such activities. Later, the Nuclear Nonproliferation Act of 1978 defined a government-wide policy objective of controlling exports of nuclear dual-use items. Together, these two public laws authorize the Department of Energy to carry out research and development on technologies needed to negotiate and verify international agreements on the control of special nuclear material (SNM) and nuclear weapons.

Another key general policy document is Executive Order 12333 (December 4, 1981), which directs the DOE to "provide expert technical, analytical and research capability to other agencies within the Intelligence Community." This injunction has been broadened over time to encompass R&D support for a variety of government agencies.

Additional guidance is contained in Presidential Decision Directives (PDDs). Most PDDs focus primarily on issue areas handled by individual NN-20 programs (e.g., nonproliferation, the CTBT, or counter-terrorism) but nevertheless have implications cutting across program boundaries.

These documents, as well as other relevant congressional legislation and congressional reports, departmental publications, speeches, and other items are described by program below.

A list of public laws, treaties, executive orders, directives, and "records of decision" bearing on DOE's overall proliferation-related missions, submitted by NN-20, is attached.

II. NUCLEAR EXPLOSION MONITORING

Table 1 describes the chain of policy documents that provide direct guidance and tasking to the NN-20 Nuclear Explosion Monitoring Program. In parallel with the emphasis of the Program, all of the documents are associated with U.S. negotiation and implementation of the Comprehensive Nuclear Test Ban Treaty (CTBT).

At the highest level, a set of Presidential Decision Directives establishes U.S. policy regarding the monitoring and verification of a CTBT with a zero-yield threshold and its connection to national nonproliferation objectives. The content and specifics of these PDDs are classified. In general (and unclassified) terms, the PDDs establish a national monitoring threshold of "a few kilotons, evasively tested." Beyond this, these documents convey no specific tasking for DOE.

A set of Presidential CTBT Safeguards was established in August 1993 to accompany U.S. support for a zero-yield CTBT. Of direct relevance to NN-20, these Safeguards call for a sustained U.S. R&D program to enhance national nuclear test monitoring capabilities.

Other key documents provide important guidance for sub-programs within the overall Nuclear Explosion Monitoring Program. For example, memoranda from John Deutch (then Undersecretary of Defense) to National Security Advisor Sandy Berger in November 1993 transferred R&D programs relevant to ground-based nuclear test monitoring from the Defense Department to DOE.

With respect to space-based systems, an Operational Requirements Document establishes operational satellite monitoring requirements for the Air Force, which utilizes sensors developed by NN-20 programs. The document conveys formal Air Force statements of need, and thus implies specific guidance for the NN-20 research efforts. In addition, numerous MOUs and similar agreements articulate the relationship between DOE and the Air Force on R&D, acquisition, integration, deployment, operation, and logistics support for the U.S. Nuclear Detonation System mission.

Table 1

Policy Guidance: The Nuclear Explosion Monitoring Program

Nuclear Explosion Monitoring Program -- Ground Based Sensors	
Source of Guidance	Comments
Presidential Decision Directives	Content and specifics are classified. These establish U.S. policy regarding the monitoring and verification of a Comprehensive Nuclear Test Ban Treaty with a zero-yield threshold. They set a national monitoring threshold of "a few kilotons, evasively tested." There is no specific tasking for DOE.
Presidential CTBT Safeguards	These safeguards are unclassified. They were established in August 1993 to accompany the U.S. support for a zero-yield CTBT. Of direct importance to NN-20, they call for a sustained U.S. R&D program to enhance national nuclear test monitoring capabilities.
Requirements for Monitoring CTBT.	Specific nuclear test monitoring requirements are derived from the top-level guidance articulated in Presidential Decision Directives (noted above).
Memoranda from John Deutch (Under Secretary of Defense) to Sandy Berger (NSC), November 1993.	These transfer R&D programs from DoD to DOE for ground-based nuclear test monitoring.

III. PROLIFERATION DETECTION

As noted above, general policy authorization and guidance are provided by the Atomic Energy Act of 1954 (as amended), and the Nuclear Nonproliferation Act of 1978, which together authorize DOE to carry out R&D on technologies needed for the negotiation and verification of international agreements on the control of special nuclear material and nuclear weapons. The NPT also implies broad monitoring requirements, and has the status of law.

A particularly important impetus for the work of the Proliferation Detection Program is the Prevention and Control of the Proliferation of Weapons of Mass Destruction Act of 1993, which directed DOE to address non-proliferation technology issues and increased its budget to do so. The 1993 legislation emphasized the roles of DOE, DoD, and the IC in preventing proliferation and in dealing with its consequences, and called on the three agencies to "maintain and improve their capabilities to identify, monitor, and respond to the proliferation of weapons of mass destruction." The legislation also established an inter-agency Non-Proliferation Program Review Committee, and tasked it with ensuring the development and deployment of "highly effective technologies and capabilities for the detection, monitoring, collection, processing, analysis, and dissemination of information in support of United States non-proliferation policy." Before the 1993 Act, the Program had focused primarily on treaty monitoring.

The September 1995 report of the National Science and Technology Council on "National Security Science and Technology Strategy" similarly highlights the role of R&D, especially in the development of technologies for detection, monitoring, and verification. It refers specifically to projects supported by NN-20 (e.g., CALIOPE), and describes the priorities of the interagency Nonproliferation and Arms Control Technology Working Group, established in August 1994 to coordinate nonproliferation-related R&D government-wide.

Another key document is "The Role of the Department of Defense and the Department of Energy with Respect to the Nonproliferation Policy of the United States" (Report to Congress Pursuant to Section 1503, National Defense Authorization Act for FY 1993). Issued January 1, 1993, this document sets out respective DoD and DOE responsibilities; it calls on DOE to manage and coordinate the scientific expertise resident in the national labs, and specifically to undertake R&D in support of the verification of nonproliferation treaties and agreements, and to develop international safeguards technologies. It also highlights DOE's R&D efforts for verifying current and potential nuclear and non-nuclear weapon treaties (e.g., LTBT, NPT, TTBT, PNET, INF, CFE, CWC, START).

Other policy guidance emanates from the DOE itself. The DOE Strategic Plan of 1994 defines DOE's national security "Goal 1" as "assure that DOE remains a full participants in preventing the spread of nuclear weapons, materials, and expertise, and the preeminent agency in providing the technology to do so." It also calls for an increase in number and quality of R&D initiatives, and emphasizes the importance of close ties to users. The 1997 Strategic Plan reiterates the general goal of advancing nonproliferation technology, and identifies three specific objectives by FY99: the development of improved technologies and systems for early detection, identification, and response to WMD proliferation and illicit materials trafficking; the development of improved sensors for treaty monitoring and verification; and the employment of "advanced technologies to provide verification confidence." Similarly, the Department's "Annual Performance Plan for FY 2000" assesses "measures and goals" for FY 1998, and describes some key priorities for FY 1999 and FY 2000, including new counter-nuclear smuggling detection technologies (one portable, one for wide area), new technologies for remote chemical detection of WMD proliferation activities, and further development of the CTBT "knowledge base."

These and other relevant documents are summarized in Table 2.

Table 2

Policy Guidance: The Proliferation Detection Program

The Proliferation Detection Program	
Source of Guidance	**Comments**
Atomic Energy Act of 1954, as amended Nuclear Nonproliferation Act of 1978	These authorize DOE to carry out R&D of technologies needed for the negotiation and verification of international agreements on the control of special nuclear material (SNM) and nuclear weapons.
Executive Order 12333 (December 4, 1981)	Directs DOE to provide technical and research support to the Intelligence Community.
Nuclear Nonproliferation Treaty (NPT)	Implies broad monitoring requirements. Obligations have the status of law.
Prevention and Control of the Proliferation of Weapons of Mass Destruction Act of 1993	A major program "driver." Calls on DOE to improve U.S. capabilities to identify, monitor, and respond to WMD proliferation, and increased its budget.
The Role of the Department of Defense and the Department of Energy with Respect to the Nonproliferation Policy of the United States (report to Congress, January 1, 1993)	Sets out respective DoD and DOE responsibilities. Directs DOE to support R&D for the verification of nonproliferation treaties, and to develop international safeguards technologies
National Security Science and Technology Strategy (report issued by the National Science and Technology Council, September 1965)	Highlights role of R&D, especially in developing technologies for detection, monitoring, and verification
Department of Energy Strategic Plan, 1994 Department of Energy Strategic Plan, 1997	Identifies key DOE goal as providing technology to prevent the spread of nuclear weapons, materials, and expertise. Calls for increased R&D efforts. Reiterates general DOE goal of advancing nonproliferation technology, with three specific objectives for detection and response to WMD proliferation and illicit materials.
Reducing the Nuclear Danger: Inventory of U.S. DOE Nonproliferation and Nuclear Threat Reduction Initiatives (October 1995)	Provides an overview of missions and goals, including for nonproliferation verification R&D (treaty monitoring, detecting proliferant activities, control of SNM, etc.).

The Department of Energy: Baseline Survey of Proliferation-Related Activities (DOE response to the Deutch/Spector Commission, February 25, 1999)	Emphasizes future-orientation of NN-20 R&D. Reiterates function of providing technical support to the Intelligence Community.
Annual Performance Plan for FY 2000	Assesses "measures and goals" for FY 1998, and identifies key priorities for FY 1999 and FY 2000 (reiterates importance of technologies for treaty monitoring, detection and identification of WMD and illicit materials trafficking, etc.)
Secretarial Speeches	Can underscore broad objectives. Example: speech by Secretary Richardson to National Press Club (March 1999): goal is "ten-fold to hundred-fold improvement" in proliferation detection capabilities

IV. PROLIFERATION DETERRENCE

The Proliferation Deterrence Program consists of five elements: Nuclear Materials, Microtechnologies, Radiation Detection Technology, Counter-Nuclear Smuggling, and the National Laboratory Initiative/"Phase I" effort. There is considerable overlap in the national-level policy guidance applicable to these sub-programs, as well as between these programs and other parts of NN-20. Thus, key high-level guidance comes through Presidential Decision Directives on nonproliferation policy and export controls, on counterterrorism, and on "protection against unconventional threats." Another PDD gives the DOE the lead in technical assessments of incidents of illicit trafficking. Together, these and other PDDs direct the U.S. government to give the highest priority to developing effective capabilities to detect, prevent, defeat, and manage the consequences of nuclear, biological, or chemical materials or weapons use by terrorists or other clandestine groups.

No unclassified information about policy guidance for the Phase I effort was available. The other four elements are treated below.

A) Nuclear Materials

The Nuclear Materials Analysis Program focuses on the detection and analysis of proliferation and terrorism threats associated with WMD; as such it derives much of its policy guidance from the same sources as NN-20's other proliferation-related activities. A set of Presidential Decision Directives provide high-level guidance. As noted above, the NSTC's 1995 "Strategy" report emphasized the need for R&D to improve U.S. capabilities to detect nuclear and other WMD-related materials, and stressed the role of the national laboratories in this regard. A series of National Defense Authorization Acts and Energy and Water Appropriations bills have emphasized since the early 1990s have underscored Congressional interest in this area as well as the importance of NN-20's technical contributions.

As in other proliferation-related program areas, the Air Force Technical Applications Center (AFTAC) plays a central role in articulating priority research areas, as a function of mission needs.

B) Microtechnologies

The over-arching national-level guidance document for the Microtechnologies (MT) Program is a Presidential Decision Directive that lays out general U.S. policy objectives for dealing with weapons of mass destruction (chemical, biological, and nuclear). The Directive calls for an examination of technology options (to achieve the broadly stated policy goals); it does not identify specific requirements. Beyond this PDD, there is no single "driver" document for this Program.

However, some of the work in the Program is done in support of other programs or policy areas for which documentation does provide additional guidance. The main examples at present are START, the Mayak agreement, and the U.S./Russia/IAEA trilateral agreement on transparency. Priority directions and requirements in these areas are communicated to program managers by the NN-20 Director and other senior staff, based on their participation in relevant interagency and departmental bodies.

C) Radiation Detection Technology

The Radiation Detection Technology Program is aimed at the development of enabling systems for radiation detection and signal analysis, in support of nonproliferation, arms control and treaty verification, and applications by DoD and U.S. civilian agencies. Primary national-level policy guidance thus comes from the PDDs noted above. Existing and anticipated treaties and agreements--e.g., the TTBT, INF, START, etc.--present requirements for identifying and classifying the materials and activities they govern. For some agreements--such as START III, Mayak, and the Plutonium Production Reactors agreement--more specific verification requirements may be developed through international negotiations and/or by interagency working groups, the latter in preparation for such negotiations or as part of the process of effecting implementation. Along with additional departmental and/or interagency guidance, these verification requirements drive much of the R&D in this program.

D) Counter-Nuclear Smuggling

A significant portion of the work in the Counter-Nuclear Smuggling Program is supported, at least in part, by funds from the Radiation Detection Technology Program. Thus, much of the policy guidance (including PDDs) for the two programs is the same. There are, however, a few items worthy of specific note. For example, the Senate Armed Services Committee mark-up of the FY 1996 DoD Authorization Bill directs the DOE to focus resources on the development of forensic capabilities to detect and track shipments of stocks of nuclear weapons material. In addition, the DOE has entered into MOUs with a variety of other U.S. government agencies, including the FBI, the Bureau of Alcohol, Tobacco, and Firearms, the Customs Service, and the Department of Justice, that help define specific R&D priorities and requirements. Also important is the "Statement of Principles on Crime Fighting Partnership" (May 1998) between DOE, Treasury, and Justice, in which DOE commits to fund and manage R&D at the national laboratories in support of anti-drug, anti-crime, and anti-terrorist efforts.

The principal sources of policy guidance for the Proliferation Deterrence Program are displayed in Table 3.

Table 3

Policy Guidance: Proliferation Deterrence Program

Proliferation Deterrence Program	
Source of Guidance	**Comments**
a) <u>General</u>	
Atomic Energy Act of 1954 (as Amended)	Among other things, broadly authorizes energy research and development under the auspices of what was to become the DOE.
Presidential Decision Directives	The content and specifics are classified. They direct the United States to give the highest priority to developing effective capabilities to detect, prevent, defeat, and manage the consequences of nuclear, biological, or chemical materials or weapons use by terrorists.
Presidential Decision Directive 62	The content and specifics are classified. Focused on protection against unconventional threats to the homeland and Americans overseas, it directs efforts to recognize the nature of unconventional threats and the need for an integrated response.
National Security Science and Technology Strategy	(See above)
Reducing the Nuclear Danger: Inventory of US DOE Nonproliferation and Nuclear Threat Reduction Initiatives	Describes ongoing activities as focusing on the design and fabrication of remote sensing systems for worldwide treaty monitoring and verification, and research to improve capability to monitor/verify current and future treaties. (See above)
US Department of Energy Strategic Plan 1997	Directs DOE to develop improved technologies and systems for early detection, identification, and response to WMD proliferation and illicit materials trafficking, develop improved sensor systems for treaty monitoring and verification, and employ advanced technologies to provide verification confidence.

Department of Energy Annual Performance Plan for FY2000	Directs NN to develop improved technologies and systems for early detection, identification, and response to WMD proliferation and illicit materials trafficking; deliver three improved sensor systems for treaty monitoring to the USAF (relevance depends on treaty in question)
FY 1992 Dire Emergency Supplemental Appropriations Act, Public Law 102-229 (Section 108)	Authorizes the Defense Department to transfer funds in order to better support the reduction of the post-Soviet nuclear threat. Relevance to DOE is inferred: by delineating the DoD role in these matters, it helps identify the DOE role.
b) Nuclear Materials	
Presidential Decision Directives	(See above.)
National Security Science and Technology Strategy	Emphasizes the need for R&D to enhance U.S. capabilities to detect proliferation of nuclear materials. The important contributions of the national laboratories are emphasized.
National Defense Authorization Act; Energy and Water Appropriations	On a continuing basis since the early 1990s, these bills have emphasized Congressional interest in nonproliferation and the importance of NN-20's technical contribution to this effort.
Definitions of research requirements	AFTAC has articulated priority research areas for this program.
c) Microtechnologies	
Presidential Decision Directive	Contents and details are classified. Calls for an examination of technology options to achieve general U.S. policy objectives for dealing with weapons of mass destruction (chemical, biological, and nuclear). Requirements are not identified.
International treaties and agreements, e.g.: • START • Mayak agreement • Trilateral agreement (US/Russia/IAEA) on transparency	Language establishes requirements for verification of compliance. Additional departmental and/or interagency guidance can specify and direct R&D efforts.

d) Radiation Detection	
International treaties and agreements, e.g.: • Nuclear Test Ban Treaty, TTBT, SALT, INF, START • Agreement Between the Department of Defense and Minatom Concerning the Safe and Secure Transportation and Storage of Nuclear Weapons Material (1992, as amended) • Trilateral agreement on transparency • Plutonium Production Reactor Agreement	As above.
Arms Control Program Plan, Fiscal Years 1999-2000, Prepared by the Office of the Undersecretary of Defense for Acquisition and Technology (to be published)	Outlines R&D requirements, including those in support of arms control and related treaties and agreements. The relevance to DOE is inferred: by delineating the DoD role, it helps identify DOE's role as well.
Joint DoD/DOE Warhead Identification Working Group Statement of Work/Joint Implementation Plan	Outlines very specific tasks in support of Mayak, START III, and the Trilateral Agreement. Also assigns organizational responsibilities (including to specific laboratories) for completing those tasks and sets timelines for doing so. (Examples of tasks: "develop and fabricate information barrier to meet START III objectives;" "develop field procedures for START III measurement set.")
e) Counter-Nuclear Smuggling	
Reducing the Nuclear Danger: Inventory of US DOE Nonproliferation and Nuclear Threat Reduction Initiatives	Describes ongoing activities as being geared to developing and applying proliferation detection technology to intelligence/law enforcement support, and providing nuclear support to the law enforcement community (as in nuclear smuggling)
SASC Mark-Up of FY 1996 DoD Authorization	SASC guidance to DOE directs that resources be focused on the development of forensic capabilities to detect and track shipments of stocks of nuclear weapons material.
Department of Energy Annual Performance Plan for FY2000	Directs NN to complete development and delivery of two new counter-nuclear smuggling detection technologies

Memoranda of Understanding with other USG Agencies: • Bureau of Alcohol, Tobacco and Firearms (May 1998) • Federal Bureau of Investigation (May 1998) • U.S. Customs Service* • Department of Justice's National Institute of Justice* *Similarity of language with the other MOUs presumed but not known. Rather than separate MOUs, these may be subsumed in the Statement of Principles (below)	Typically, these commit DOE's "partner" agencies to establish technical requirements and goals; DOE/NN is then tasked with identifying and coordinating the use of DOE capabilities, facilities, technologies, and resources to support those requirements and goals. Parties commit to joint development of a program plan, with prioritized projects, to accomplish stated objectives; to preparing and reviewing comprehensive work packages (describing activities, milestones, and deliverables); and to conducting project reviews. Direct communication and coordination between the above-named offices and their components/labs is "envisioned and encouraged."
Statement of Principles on Crime Fighting Partnership Between the Department of Energy and the Department of the Treasury and the Department of Justice (May 1998)	All three agree to deploy technologies developed at the DOE laboratories to support anti-drug, anti-crime, and anti-terrorist efforts. DOE agrees to direct the national laboratories to support the development of additional tools in regards to the above.

V. THE CHEMICAL AND BIOLOGICAL NONPROLIFERATION PROGRAM

The Chemical and Biological Nonproliferation Program is a new effort, responding to a new policy concern. National-level guidance for the Program is thus of recent vintage, and often is still being developed. As was the case with the Proliferation Detection Program, important early impetus for the Chem/Bio program came from the Congress.

A major early document for the Program was the Counterproliferation Program Review Committee's May 1996 "Report on Activities and Programs for Countering Proliferation," which recommended establishment of a joint DOE, DoD, and U.S. intelligence community R&D initiative in chemical and biological defense, citing in particular the technical expertise in chemical and biological sciences resident in the DOE laboratories. A few months later, in September 1996, Congress passed the National Defense Authorization Act for Fiscal Year 1997 (PL 104-201); and Title XIV (the "Defense Against Weapons of Mass Destruction Act of 1996") highlighted the "significant and growing threat of attack by weapons of mass destruction on targets that are not military targets in the usual sense of the term," and found that "the threat posed to the citizens of the

United States by nuclear, radiological, biological, and chemical weapons delivered by unconventional means is significant and growing." It authorized an R&D role for DOE and provided for a $17 million increase in the nonproliferation and verification R&D budget, focusing on detection technologies.

This Congressional language was followed by several Presidential-level initiatives, most importantly PDD-62 ("Protection Against Unconventional Threats to the Homeland and Americans Overseas") of May 1998. President Clinton referred to this initiative in his commencement address to the U.S. Naval Academy later that month, saying that "we will undertake a concerted effort to prevent the spread and use of biological weapons, and to protect our people in the event these terrible weapons are ever unleashed."

Relevant departmental documents include "The Department of Energy: Baseline Survey of Proliferation-Related Activities" (the DOE's response to the Deutch/Spector Commission), that refers to formal agreements between NN-20 and the Departments of Justice and Treasury to provide technologies relevant to fighting crime and terrorism. As a result, NN-20 seeks partnerships with various non-Federal law enforcement agencies to develop realistic R&D requirements. Even earlier, the October 1995 DOE publication "Reducing the Nuclear Danger" noted that among the important DOE missions is to develop and apply proliferation detection technology and related support to the law enforcement community. Finally, the priority that DOE attaches to the chem/bio nonproliferation effort has also been stressed by secretaries Pena and Richardson.

Table 4 summarizes these sources of national-level policy guidance.

Table 4

Policy Guidance: The Chem/Bio Program

The Chem/Bio Program	
Source of Guidance	**Comments**
Presidential Decision Directive 62, *Protection Against Unconventional Threats to the Homeland and Americans Overseas,* May 1998	Content and specifics are classified. Directs efforts to recognize the nature of these threats and the need for an integrated response.
National Defense Authorization Act for Fiscal Year 1997 (PL 104-201), Title XIV (Defense Against Weapons of Mass Destruction Act of 1996), September 1996	Congress found that: _ "There is a significant and growing threat of attack by weapons of mass destruction on targets that are not military targets in the usual sense of the term", and _ "the threat posed to the citizens of the United States by nuclear, radiological, biological, and chemical weapons delivered by unconventional means is significant and growing" _ Cited proliferation of chemical and biological weapons as "arguably the most urgent and serious threat the United States faces today" (Conference Report) _ Authorized R&D role of DOE and a $17 million increase in the nonproliferation and verification R&D budget, focusing on detection technologies.
Report on Activities and Programs for Countering Proliferation, Counterproliferation Program Review Committee, May 1996	Recommended establishment of a joint DOE, DoD, and U.S. Intelligence R&D initiative in chemical and biological defense. Cited technical expertise in chemical and biological sciences resident in the DOE laboratories.
Speech by President Clinton, *U.S. Naval Academy Commencement Address*, May 22, 1998	"…we will undertake a concerted effort to prevent the spread and use of biological weapons, and to protect our people in the event these terrible weapons are ever unleashed by a rogue state, a terrorist group or an international crime organization."
Speech by Secretary Richardson, *Securing America from Emerging Threats in the 21st Century,* National Press Club, March 1999	"I have challenged our best and brightest in the national laboratories to develop, demonstrate and deliver the first phase of a biological detection system…. that will help us protect critical assets such as subway systems, or major events such as a Super Bowl or the Olympics"
Verbal Guidance by Secretary Pena, Spring 1998	Develop the most aggressive plan possible for technology development at the DOE labs to address the chem-bio threat

VI. CRS, GAO, AND CBO EXAMINATIONS OF NONPROLIFERATION R&D

A) Congressional Research Service

The Congressional Research Service (CRS) has not at present been tasked with any studies directly pertaining to the nonproliferation R&D program supervised by DOE's NN-20. In July of 1998, a CRS *Report on the Department of Energy's FY 1999 Research and Development Budget* noted that DOE funds research to support nonproliferation, described that research in very broad terms, and provided budget data for FY 1998 and FY 1999. The CRS wrote that both the House and Senate approved the $210M authorization in the FY1999 Defense Authorization Bill, and that the Senate expressed support of DOE activities in this area. The report notes, however, that the House "expressed concern" about a lack of focus in the program and the absence of an overall program plan or "technology roadmap," and suggested an external peer review.

The CRS is not mandated to provide recommendations when it reviews programs.

B) General Accounting Office

Several General Accounting Office (GAO) studies have bearing on NN-20's research and development programs, but currently available GAO reports do not cover the full scope of NN-20 research. There do exist a number of GAO studies pertaining to government R&D more broadly, including such issues as peer review, and there is a series of GAO reports on the subject of counterterrorism.

The most directly relevant recent report is *Chemical and Biological Defense: Coordination of Nonmedical Chemical and Biological R&D Programs* (GAO/NSIAD-99-160). This report considers the DOE program alongside those administered by DoD, DOE, DARPA, and the Technical Support Working Group (TSWG).

The above report also has a companion analysis: *Chemical and Biological Defense: Program Planning and Evaluation Should Follow Results Act Framework* (GAO/NSIAD-99-159). This study focuses primarily on DoD application of the Government Performance and Results Act to the chemical and biological defense R&D effort. DOE is not the focus of this study. However, the report does note that DOE laboratories perform research in support of both the DoD and DOE programs in this area, and expresses concern about the absence of a performance plan on the part of DARPA, DOE, or the Joint Program Office for Biological Defense. (The Report notes that DOE has included a 5-year roadmap for developing, demonstrating and delivering technology in its strategic plan.)

The GAO has also issued several studies relating broadly to the Department of Energy, and thus touching on NN-20. For example, *DOE's Fiscal Year 2000 Performance Plan* (GAO/RCED-99-218 R) recommends that performances measures be organized by DOE organization, so as to enable better tracking. Other GAO reports focus broadly on government-funded and -sponsored research and development. An example is *Measuring Performance: Strengths and Limitations of Research Indicators* (GAO/RCED-97-91), which points out the limitations of spending data as an indicator of effectiveness.

Finally, the GAO has issued a series of "Combating Terrorism" reports, several of which touch on DOE efforts in this sphere. *Combating Terrorism: Federal Agencies' Efforts to Implement National Policy and Strategy* (GAO/NSIAD-97-254), includes a chart of USG agencies' WMD-related capabilities; DOE's capacity to "identify or evaluate WMD agents," for example, is included with a list of relevant DOE organizations.[1] *Combating Terrorism: Observations on Federal Spending to Combat Terrorism, Congressional testimony by Henry L. Hinton, Jr.* (GAO/T-NSIAD/GGD-99-107) includes a chart of agency counter-terrorism budgets for FY2000, including DOE's. *Combating Terrorism: Issues to be Resolved to Improve Counterterrorism Operations* (GAO/NSIAD-99-135) lauds DOE for its use of "after action reports" following anti-terrorism exercises. A third report, *Combating Terrorism: Spending on Government-wide Programs Requires Better Management and Coordination* (GAO/NSIAD-98-39), recommends more structured NSC and OMB oversight and control of government anti-terrorism efforts. None of these reports, however, appear to have direct bearing on the issues that were raised by the House concerning the NN-20 programs.

C) Congressional Budget Office

There is only one readily available CBO study relevant to the NN-20 mission. This is a May 1999 study, *Cooperative Approaches to Halt Russian Nuclear Proliferation and Improve the Openness of Nuclear Disarmament*, in which the Congressional Budget Office (CBO) wrote that there is a need to increase funding for DOE's Warhead Dismantlement and Fissile Materials Transparency Program to enable more joint and US analyses and demonstrations. Some of the related work is, of course, conducted under the auspices of NN-20. CBO's recommendation that the "Second Line of Defense" program, which would enhance Russian ability to detect nuclear materials,

[1] The organizations are the joint Technical Operations Team, the Nuclear-Radiological Advisory Team, the Nuclear Emergency Search Team, and the Lincoln Gold Augmentation Team.

specifically at customs points, be established and expanded, bears on DOE/NN-20 research related to radiation detection and counter-nuclear smuggling.

Attachment to Appendix C

NN-20 SUBMISSION:
U.S. NATIONAL SECURITY LAWS/TREATIES/STATUTES/DIRECTIVES
APPLICABLE TO THE DEPARTMENT OF ENERGY

Public Laws:

Defense Production Act of 1950 (50 U.S.C. App. 2061 et seq.) - Conversion of civilian materials to military use.

Atomic Energy Act of 1954 (42 U.S.C. 2011 et seq.), as amended (Public Law 83-703):

- 4 (42 U.S.C. 2051-2053) - R&D in the theory and production of atomic energy, including application for military purposes
- 5 (42 U.S.C. 2061-2064) - Production of special nuclear materials
- 6 (42 U.S.C. 2071-2078) - Special Nuclear Material
- 7 (42 U.S.C. 2091-2099) - Source Material
- 8 (42 U.S.C. 211-2114) - Byproduct Material
- 9 (42 U.S.C.~ 2121-2123)- Military application of atomic energy
- 10 (42 U.S.C. 2131-2141) - Atomic Energy Licenses
- 11 (42 U.S.C. 2151-2160)- 11 International Activities
- 12 (42 U.S.C. 2161-2169) - Control of Restricted Data and establishment of personnel security program
- 13 (42 U.S.C. 2181-2190) - Patents and Inventions
- 18 (42 U.S.C. 2271-2284) - Criminal provisions relating to security functions
- 25 (42 U.S.C. 2035) - Establishes the Division of Military Application
- 31 (42 U.S.C. 2051) - Atomic energy research and development activities through contracts, agreements and loans with private or public institutions or persons, including foreign governments
- 161 (42 U.S.C. 2201) - Protection of nuclear materials and Restricted Data

Department of Energy Organization Act (DOE Act) - (42 U.S.C. 7101 et seq.)

Attachment to Appendix C

- 102(10) (42 U.S.C. 7112(10)) - Authorizes DOE to undertake international energy activities, in coordination with the Secretary of State

- 309 (42 U.S.C. 7158) - Naval reactors

Energy Reorganization Act of 1974:

- 103(8) and 107(a) (42 U.S.C. 5813(8) and 5817(a)) - DOE may encourage and participate in international cooperation in energy and related environmental research and development, and DOE may make arrangements for the conduct of research and development activities with private or public institutions, including participation in joint or cooperative projects of a research, developmental or experimental nature

- 104 (42 U.S.C. 5814) - Naval reactors

Arms Export Control Act of 1976

Annual Department of Energy National Security Authorization Acts, 1977 to present (since 1986, enacted as title XXXI of National Defense Authorization Acts), including:

Department of Defense Authorization Act, 1985, _1634 - Freezes E.O. 12344 on Naval Reactors in place unless changed by law (42 U.S.C. 7158 note)

National Defense Authorization Act for Fiscal Year 1993, _~ 3161 and 3163 (42 U.S.C. 7274h, 7274j) - DOE defense nuclear facilities workforce restructuring plan

National Defense Authorization Act for Fiscal Year 1994, _ 3138 (42 U.S.C. 2121 note) - Establishes the Stockpile Stewardship Program

National Defense Authorization Act for Fiscal Year 1995, _ 3131 (Public Law. 103-337) - Provides a "Stockpile Stewardship Recruitment and Training Program"

National Defense Authorization Act for Fiscal Year 1996, _ 3133 (42 U.S.C. 2121 note)- Establishes a tritium production program capable of meeting the tritium requirements of the United States for nuclear weapons

National Defense Authorization Act for Fiscal Year 1997, _ 1441 (Public Law 104-201) - Establishes National Coordinator on Nonproliferation (for weapons of mass destruction) and provides funding for cooperative plutonium disposition activities with Russia

Attachment to Appendix C

Nuclear Nonproliferation Act of 1978 (Public Law 95-242)

Cooperative Threat Reduction Authorization

Arms Export Control Act and Foreign Assistance Act (22 USC 2798) as amended

Export Administration Act of 1979, as amended

Public Law 95-124, Resource Conservation and Recovery Act

Public Law 96-510, Comprehensive Environmental Response, Compensation and Liability Act

Public Law 99-499, Superfund Amendments and Reauthorizations Act

Public Law 100-707, Disaster Relief and Emergency Assistance Amendments of 1988 (Stafford Act)

Public Law 101-510, Missile Technology Control Act of 1990

Public Law 101-549, Clean Air Act Amendments of 1990

Soviet Nuclear Threat Reduction Act of 1991 (and subsequent amendments) (22 U.S.C. 2551 note) - Provides authority for the transfer of certain funds to DOE for use in assisting in certain nuclear activities in the independent states of the former Soviet Union.

Energy Policy Act of 1992, __2121-2124 (42 U.S.C. 13491-13494) -Advanced nuclear reactors R&D

Federal Response Plan for Public Law 93-28, April, 1992

Atomic Weapons and Special Nuclear Materials Rewards Act, __2-7 (50 U.S.C. 47a-47f) - Rewards for information on illegal possession of atomic weapons or special nuclear material

Public Law 102-386, Federal Facilities Compliance Act

Public Law 102-484, Iran-Iraq Nonproliferation Act of 1992

Weapons of Mass Destruction Control Act of 1992

Public Law 103-236, Nuclear Nonproliferation Act of 1994

Public Law 103-337, National Defense Authorization Act for Fiscal Year 1995, October 1994, amending the DOE Organization Act and creating the Office of Fissile Materials Disposition reporting to the Undersecretary of Energy.

Federal Radiological Emergency Response Plan, May 1996

Public Law 104-106, Section 3158, Responsibility for Defense Programs Emergency Response Program, 10 February 1996

Attachment to Appendix C

Public Law 104-29, Economic Espionage Act of 1996

Public Law 104-132, Antiterrorism and Effective Death Penalty Act of 1996

Public Law 104-201, National Defense Authorization Act for FY1997

Cooperative Threat Reduction Act II, 1996: Chemical and Biological Weapons Nonproliferation

DoD CJCS CONPLANs 0300-97 (draft) and 0400, Rapid Emergency Actions to Counter Terrorism Directed Against Domestic and Overseas United States Citizens, Interests and Property

Treaties and Agreements:

START I

START II

Open Skies Treaty

Agreement between the Government of the United States of America and the Government of the Russian Federation Concerning the Disposition of Highly Enriched Uranium Extracted from Nuclear Weapons, February 18, 1993

Comprehensive Test Ban Treaty

Helsinki Joint Statement on Future Reductions in Nuclear Forces (START III)

Agreement Between the Department of Defense of the USA and the ministry of the Russian Federation for Atomic Energy Concerning Control Accounting and Physical Protection of Nuclear material dated September 2, 1993

NSC Memorandum (1974), and National Disclosure Policy Committee, as modified in 1994.

Agreement between the Defense Department of the USA and the Ukrainian State Committee on Nuclear and Radiation Safety Concerning Development of State Systems of Control, Accounting, and Physical Protection of Nuclear Materials to Promote the Prevention of Nuclear Weapons Proliferation from Ukraine, June 17, 1995

Joint Statement on Cooperation Between the Ministry of Defense of the Russian Federation and the United States Department of Energy on Control, Accounting and Physical Protection of Nuclear Materials, January 30, 1996 and July 16, 1996

Agreement between the Government of the US And the Government of the Russian Federation concerning Cooperation Regarding Plutonium Production Reactors, September 23, 1997.

Joint Statement on the Activities of the International Nuclear Safety Centers, September, 1997

Attachment to Appendix C

Joint Statement on U.S.-Russian Cooperation to Implement the Nuclear Cities Initiative, July 24, 1998

Scientific and Technical Cooperation in the Management/Disposition of Plutonium which Has Been Designated To Be No Longer Required for Defense Purposes, July 1998

Memorandum of Cooperation on Matters Pertaining to the Protection of Nuclear materials between the Office of Nonproliferation and National Security of the U.S. Department of Energy and the Main Command of the Internal Troops of the Russian Ministry of Interior (MVD) Concerning Cooperation, September, 1998

Agreement between the Government of the U.S. and the Government of the Russian Federation on the Nuclear Cities Initiative, September 22, 1998

Executive Orders:

Executive Order 10450 - Security Requirements for Government Employees
Executive Order 10865 - Safeguarding Classified Information Within Industry
Executive Order 10480 - Defense Production Act Priority Contracting and Allocation Authority
Executive Order 11057 - Communication of Restricted Data
Executive Order 11912 - DPA Priority Contracting and Allocation Authority to Maximize Domestic Energy Supplies
Executive Order 11953 - Emergency Preparedness
Executive Order 12058 - Delegation of Authority to the Secretary of Energy
Executive Order 12333 - Functions and Responsibilities of U.S. Intelligence Community
Executive Order 12334 - President's Intelligence Oversight Board
Executive Order 12356 - Special Access Programs for Intelligence Information
Executive Order 12656 - Assignment of Emergency Preparedness Responsibilities
Executive Order 12742 - National Security Industrial Responsiveness
Executive Order 12829 - Administration of Export Controls
Executive Order 12938 - National Emergency in Regards to Weapons of Mass Destruction
Executive Order 12958 - Procedures for Classification of National Security Information
Executive Order 12968 - Procedures for Access to Classified Information
Executive Order 12981 - Administration of Export Controls
Executive Order 13010 - Protection of Critical Infrastructure
Executive Order 13021- Administration of Export Controls on Encryption Products

Directives:

PDD 13 – Non-Proliferation and Export Controls
PDD 15 –
PDD 17 –
PDD 18 –
PDD 23 – Foreign Access to Remote Sensing Space Capabilities
PDD 27 –
PDD 29 – Security Policy Coordination
PDD 34 – Conventional Arms Transfer Policy
PDD 35 –
PDD 37 –
PDD 39 –

Attachment to Appendix C

PDD 41 –
PDD 42 – International Organized Crime
PDD 47 –
PDD 50 –
PDD 55 –
PDD 60 –
PDD 62 – Protection Against Unconventional Threats to the Homeland and Americans Overseas.
PDD 63 - Critical Infrastructure Protection and Information Assurance

Records of Decision

Record of Decision by Secretary of Energy Hazel O'Leary on the Disposition of Surplus U.S. Highly Enriched Uranium (July 1996) - U.S. to maximize the blend down of surplus HEU to LEU for burning in commercial reactors.

Record of Decision by Secretary of Energy Hazel O'Leary on the Storage and Disposition of Surplus Weapons-Usable Fissile Materials (January 1997) - Set forth the hybrid strategy (both immobilization and MOX/reactor) for disposing of surplus U.S. weapons plutonium as well as a plan for reducing the number of sites where surplus weapons plutonium is stored.

APPENDIX D:

NN-20 Research on Nonproliferation Technologies: A Brief History

CONTENTS

NN-20 Research on Nonproliferation Technologies:
A Brief History

This paper is meant to convey the key features in the evolution of the Department of Energy's research on nonproliferation and related technologies. It was prepared by RAND staff, at the request of the Nonproliferation and National Security Advisory Committee (NNAC). The paper focuses on two aspects in particular: (a) the principal activities and emphases of the research supported by DOE's Office of Nonproliferation Research and Engineering (NN-20) and its predecessors; and (b) the changing organizational structures within which that work has been carried out.[1]

A) The Early Years

For the first several decades after World War II, there was little centralized coordination of the research and development performed by the National Laboratories in support of U.S. government nonproliferation and other arms control objectives. Instead, the labs tended to deal directly with their customers in the military and the intelligence community. Indeed, according to one official, even in the early 1970s the coordination function, such as it was, was performed by a single officer, who discussed the verification requirements flowing from the Limited Test Ban Treaty with lab personnel.

The institutionalization of a more centralized, Washington-based coordination and oversight role can be traced to December 1971, when then-chairman of the Atomic Energy Commission James Schlesinger created a new Division of International Security Affairs (ISA) and tasked it with supporting U.S. government arms control policy, among other responsibilities. In June 1972, an official with a technical background--from the Defense Advanced Research Projects Agency (DARPA)--was appointed Director. When the Energy Research and Development Administration (ERDA) was established in January 1975,[2] ISA was carried over to the new structure, with arms control and disarmament as one of its main functional areas. It reported to the Assistant Secretary for Defense Programs (DP), through a Deputy Assistant Secretary for Security Affairs.

In practice, ISA's arms control agenda focused on nuclear testing. The Threshold Test Ban Treaty (TTBT) and the Peaceful Nuclear Explosions Treaty (PNET) had been signed the previous July, and monitoring these treaties generated a clear need for better coordination between the research efforts at the labs and the policy concerns in Washington. A Deputy Director for Programs was thus made explicitly responsible for "support activities, including research," and a

[1] This account is based on internal AEC, ERDA, and DOE documents, and on interviews with current and former DOE officials familiar with this history. Any mistakes of omission or commission are the author's.
[2] ERDA was created by the Energy Reorganization Act of 1974.

Technical Support Branch was created to serve as the "focal point for obtaining technical and scientific support from...the ERDA laboratories concerned with nuclear arms control-related research and development."[3]

As a by-product of the CTB negotiations, ISA's interactions with the national laboratories increased considerably during the Carter years. Even when the CTB talks collapsed, the interagency policy community continued to grapple with a range of test-related issues that called for technical input from the national laboratories. To improve management of these relationships, in June 1977 ERDA's arms control functions were consolidated under ISA, and the broad purposes and directions of the Agency's related R&D were spelled out.[4] A Verification and Control Technology program was created within ISA, and given a mandate to support research in such areas as detection technology, seismology, non-seismic techniques for detecting underground explosions, and remote sensing. Nevertheless, much of the funding for the R&D was administered not by ISA but elsewhere in Defense Programs; ISA did not have formal authority to coordinate verification R&D, nor did it control the funding for those purposes. In 1980, however, Energy Secretary Schlesinger agreed that ISA should have the formal authority to coordinate verification R&D on behalf of the Department, subject to the proviso that the ISA role would *not* be to "direct" the research but rather to serve as the labs' coordinator with and liaison to the policy community.[5]

By the end of the Carter administration, ISA had settled in to a structure of three divisions: Defense Intelligence, Political-Military Security Affairs, and Systems and Technology (S&T--essentially a re-naming of the Verification and Control Technology program). (See Figure 1.) S&T's Technical Program Branch administered the R&D programs in verification and control technologies, and served as DOE's technical liaison to DoD, the intelligence and arms control communities, and other government agencies concerned with verification and monitoring.

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[3]ERDA Manual, 26 March 1975.

[4]The consolidation was made explicit in a June 1977 "Memorandum of Understanding on Arms Control Matters" (U) between ISA and the Division of Military Application (DMA). The memorandum covered three areas: "arms control initiatives, negotiations and treaties related to nuclear explosives; test ban verification (and associated research and development); and research, study and measures to understand, detect and/or prevent evasion or the clandestine testing of nuclear explosive devices."

[5]Interviews. Also see "A Brief Examination of the Relationship Between the Nuclear Weapons Laboratories and OISA" (U), Eagle Research Group, June 27, 1985. According to this memorandum, the laboratories viewed the ISA projects at that time as "a kind of sustaining effort, mostly self-directed," that would allow the labs to assist ISA with arms control issues as they arose.

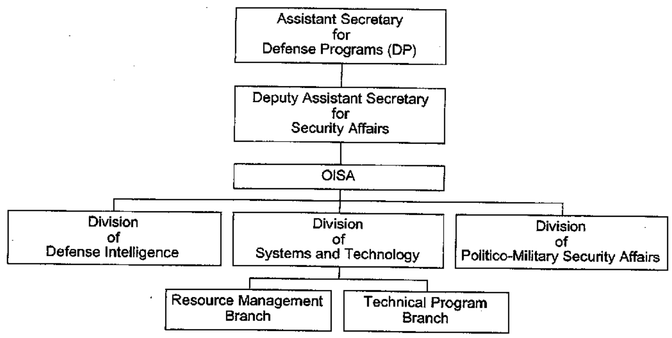

Figure 1. Office of International Security Affairs, 1980

B) The Reagan and Bush Administrations

The Reagan years, however, witnessed a series of organizational changes. First, in 1985 the three ISA divisions were reduced to two, but the Systems and Technology Division remained intact, and continued to be responsible for managing the Department's research programs for verification and control technologies. Two years later, ISA was reorganized once more, this time taking on new functions in arms control policy, export control, and technology transfer issues. Intelligence-related functions were separated out of the new structure, but the Systems and Technology Division and its research function again remained in place. (See Figure 2.)

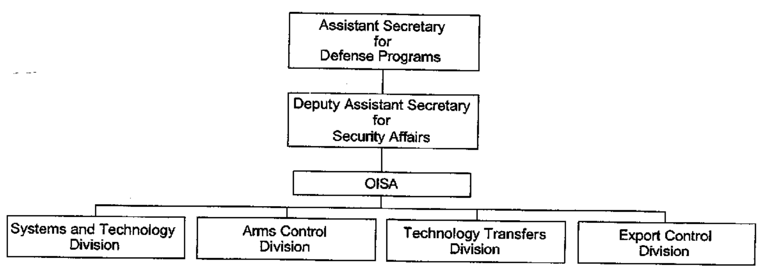

Figure 2. Office of International Security Affairs, 1987

These reorganizations were in part a result of the fact that, by the mid-1980s, the research programs in ISA's Systems and Technology Division had begun to broaden in scope, spurred by two developments in particular. One was the Intermediate-Range Nuclear Forces (INF) negotiations, which gathered momentum in 1986-87 and generated new requirements for monitoring nuclear warheads and their delivery systems. Technologies for this task were developed in the national labs, with Sandia playing an especially prominent role. A second impetus came from the multilateral discussions on chemical weapons (CW) at the Committee on Disarmament in Geneva: when the Soviet Union took a position there in favor of an ambitious verification regime, CW monitoring issues were placed on the U.S. policy agenda, and the development of relevant systems and technologies began to receive more attention, including from DOE and the national labs. (As noted below, however, CW issues became a major part of the DOE research portfolio only later, in the mid-1990s.)

This growth in ISA's research functions--and the government's more complicated arms control agenda which it reflected--put an increasing premium on coordination both within DOE and between the Department and the rest of the policy community. But, according to DOE officials, even within ISA there was often a lack of communication between the S&T division on the one hand, and the Arms Control division on the other. To address these concerns, an Arms Control Working Group (ACWG) had been created within DOE, tasked with coordinating the technical analysis assigned to the Department in interagency forums. In practice, this meant that the ACWG was to oversee--and, if necessary, order--cooperation between the S&T and Arms Control divisions within ISA, and between those offices and other components of Defense Programs; the ACWG also began to provide the DOE representation to inter-agency groups.

In short, the ACWG was an attempt to improve the link between technology and policy. Apparently the ACWG worked reasonably well in that role, but not well enough: DOE officials continued to see a need for a more coherent, institutionalized structure to deal with the technology/policy nexus. By 1987, S&T's research on verification technologies encompassed more than 70 research projects. Managing and providing coherence to this array of projects were becoming increasingly difficult for a staff that itself had grown little over the years, and staff-level interactions between S&T and the Arms Control division were still judged inadequate. Officials were also dissatisfied with DOE's role and effectiveness in the inter-agency policy community.

The solution was a third re-organization, late in the Reagan administration, designed to streamline and consolidate the arms control-related work and to raise the stature of the arms control function within DOE. ISA was eliminated altogether, its technology transfer and export control functions assigned elsewhere, and a new Office of Arms Control was established to administer the two remaining elements--the Systems and Technology Division (where the R&D was done) and an Arms Control Policy Division. The new Office of Arms Control reported directly to the Assistant Secretary for Defense Programs (not through a Deputy Assistant Secretary, as before), and through him to the Secretary. (See Figure 3.)

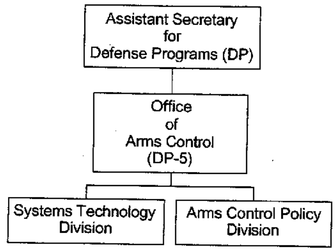

Figure 3. Office of Arms Control, 1988

After a top-to-bottom review of defense and arms control policies early in the Bush administration, DOE implemented yet another major reorganization--one which sought to re-establish the links between arms control work (including the R&D) on the one hand, and other proliferation-related aspects of the DOE portfolio on the other. The export control and technology transfer functions were re-combined with the arms control units, and responsibility for international safeguards and other nonproliferation policy matters (such as the Department's work with the International Atomic Energy Agency in Vienna) was added to the mix. The result was a new Office of Arms Control and Nonproliferation (designated "AN"), with divisions in arms control policy, international nonproliferation policy, export controls and safeguards, and research and development. The new AN was also given an organizational boost within the Department: it was taken out from under the Assistant Secretary for Defense Programs (DP), and now reported directly to the Secretary.

The Bush years also witnessed a considerable expansion in both the scope and the volume of the R&D supported by AN's Systems and Technology Division. First of all, AN officials succeeded in enhancing DOE's involvement in the broader inter-agency arms control agenda. That agenda was itself becoming increasingly ambitious. Particularly important in this regard was the START process, which generated new and challenging verification requirements. By the early 1990s, the functions of AN's "treaty monitoring" R&D thus went well beyond the traditional (and still core) work on nuclear testing. Secondly, when the New Production Reactor (NPR) was cancelled, then-Secretary Watkins proposed that a large share of the NPR funding be re-allocated to DOE's work on nonproliferation. The proposal was accepted, and the result was an infusion of some $70-80 million dollars in additional funding for AN, the great bulk of which went to support new R&D on "proliferation detection."[6] All in all, AN's total R&D funding nearly doubled, rising from about $100 million per year in 1987 to some $200 million by 1993.[7]

C) The Clinton Administration

Total funding for nonproliferation research and development has remained fairly constant for most of the Clinton administration. There have, however, been important organizational and programmatic changes.

Organizationally, the major change has been the transition from AN to the current structure of the Office of Nonproliferation and National Security (NN). NN was created in 1993, initially combining the old AN office with new units responsible for energy intelligence and for safeguards and security. In later realignments these latter functions have been moved elsewhere, while other functions have been added. The current five-office structure reflects a focus on the new, post-Cold War array of international proliferation-related concerns on DOE's agenda. Thus, a new office for nuclear safety and cooperation has come under NN's wing, while an on-going (five-six year) initiative in nuclear material protection grew large enough to become a major, self-standing program in its own right. In addition, the head of NN has been elevated to Assistant Secretary status, and its offices--including the Office of Nonproliferation Research and Engineering (NN-20)--are now headed by Deputy Assistant Secretaries. (See Figure 4.)

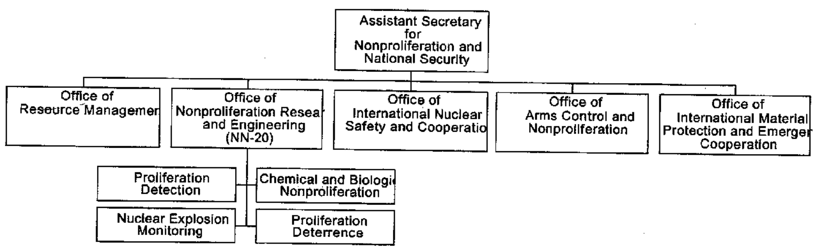

Figure 4. Office of Nonproliferation and National Security

The key substantive change during the Clinton administration has been the addition of a major program in chemical and biological nonproliferation to the NN-20 R&D portfolio. There had, in fact, been some R&D efforts on chem/bio issues carried out by the old Systems and Technology division in the late 1980s, in support of the Chemical Weapons Convention. Most of

[6]This new emphasis on proliferation detection was given legislative force in the Prevention and Control of Weapons of Mass Destruction Act of 1993, which explicitly directed DOE to address nonproliferation technology issues and increased its budget to do so.
[7]See, for example, the Statement by Dr. Victor E. Alessi, Director, Office of Arms Control and Nonproliferation, to the FY 1994 Appropriations Hearings, April 28, 1993.

this was a direct off-shoot of work in the national laboratories on satellite detectors of nuclear explosions: it turned out that analysis of nuclear explosions produced useful capabilities for detecting trace chemicals in general. But DOE's work was temporarily de-emphasized in the early-to-mid 1990s[8], not to be revived until a series of Congressional initiatives placed chem/bio nonproliferation squarely on DOE's agenda. In particular, the Defense Against Weapons of Mass Destruction Act For Fiscal Year 1997 stressed this threat, and allocated $17 million to DOE's budget for chem/bio detection technology. DOE concentrates on domestic preparedness, and NN-20's R&D focuses on providing tools for "first responders" to detect and identify chemical and biological agents. Spending in this area increased slightly (to about $19 million) in FY 1998 and FY 1999, but Congress has authorized a major funding spike (to $32 million, $10 million more than DOE requested) for FY 2000; and current program plans call for spending on chem/bio R&D to rise to more than $100 million over the next five years.

[8]Several DOE officials suggest that this was due, at least in part, to an early-1990s agreement between DoD and DOE, according to which DOE would focus on nuclear-related R&D while DoD would be responsible for chem/bio work. They suspect that this understanding was "over-interpreted" in DOE, and the chem/bio work was stopped.

APPENDIX E:

NN-20 Review and Selection Processes

CONTENTS

NN-20 Review and Selection Processes

This paper characterizes the processes by which projects funded by DOE's Office of Nonproliferation Research and Engineering (NN-20) are selected and reviewed. The paper was prepared by RAND staff at the request of the Nonproliferation and National Security Advisory Committee (NNAC). The discussion is organized by program area.

Several general points should be noted at the outset. First, NN-20 staff and management stress that NN-20 is not a science program, but rather a program of applied engineering and development. As such, NN-20 programs inevitably depend very heavily on interactions with users. For these reasons, the standard NSF "peer review" model is not applied as such (though elements of that model are adopted for the particular purposes and requirements of NN-20).

Second and relatedly, NN-20 project activities are often interdisciplinary: they are meant to bring together lab capacities with operators, industry, and others. NN-20 staff and management regard making and managing these connections as an important part of their work. This consideration conditions the criteria they apply to project selection and review.

Third, NN-20 also interacts closely with NN-40 (policy) and with DoD (especially OSD/Policy and the Defense Threat Reduction Agency). These interactions often produce program plans laying out specific R&D efforts, in areas where firm requirements do not yet exist. (An example: monitoring warhead dismantlement in START III.) In other words, an important part of NN-20 work is directed at anticipating what might be needed in the future. This has important implications for the various selection and review processes carried out within NN-20.

Finally, there are considerable variations by program, reflecting differences in size, levels of "maturity" (how long they have been in existence), and other factors. For example, the Chem/Bio program is new, and addresses issues where some of the underlying scientific issues (e.g., of signature propagation) are not well understood. As a result, it tends to involve more fundamental science than the other programs do. Other programs, by contrast, involve large multi-year projects, based on priorities which are more firmly established and which tend to change more slowly over time.

There are, however, major elements of these selection and review processes common to NN-20 as a whole. Most NN-20 research projects are selected as part of the annual budget planning process with the National Laboratories. Each year, in response to a memorandum from the NN-20 Director (frequently referred to as a "Call for Proposals"), the Labs submit Project Lifecycle Plans (PLP) that prioritize new research efforts along with currently funded projects. Each of the plans is targeted to a specific portion of the NN-20 program, with projected funding levels over the next five fiscal years. Detailed statements of work are provided for each of the projects (new and existing), describing their contribution to NN-20 program goals, scientific and technical merit, and specific tasks to be accomplished.

Together with users and outside experts, NN-20 program staff review the resulting proposals and recommend final project selections.

All NN-20 projects are required to submit quarterly reports, indicating their technical progress to date, issues and problems, milestones and schedules, and cost data. These reports are supplemented by a great deal of personal contact between NN-20 staff and the PIs and their program managers at the labs; these meetings take place 2-3 times per year, for all projects, and result in status reports of varying degrees of formality. In addition, each project is given one formal program review per year, in which the PIs make structured presentations to NN-20 staff. Again, this is a requirement for all NN-20 programs.

An example of the "Call for Proposals" for FY 2000 is attached to this Appendix. (Note that the example dates from March 1999; the names of some NN-20 programs have changed since that time.)

The selection and review processes carried out by the various NN-20 programs are described below.

A) NUCLEAR EXPLOSION MONITORING

For ground-based sensors, national laboratory projects are submitted as part of the project lifecycle planning process. Selection is based on reviews by NN-20 and the Air Force Technical Applications Center (AFTAC), considering the potential contribution to the overall program goals. Contractors outside of the National Laboratories (e.g., universities, companies, US government agencies) submit research proposals in response to Broad Area Announcements that NN-20 publishes in the Commerce Business Daily. Selection is based on reviews by NN-20 staff, AFTAC, National Lab scientists, and the external research community.

Research on satellite sensors has been performed under an almost continuous tasking to Los Alamos and Sandia National Laboratories, that originated with the VELA program in the early 1960s. Except for a small external research project transferred from DoD, there have been no new projects in this program element over the past five years. On an annual basis, NN-20 provides specific direction for the ongoing research projects through the project lifecycle planning process. The Air Force and Intelligence Community provide input and guidance for these efforts.

B) PROLIFERATION DETECTION

The Proliferation Detection Program is distinctive in that it funds a small number of relatively large, multi-year projects. These features condition the Program's selection and review processes in several respects. First, because the Program goals and priorities tend to be quite stable over time, the Program stresses evolutionary technical development; hence, the labs do not usually submit new proposals each year but rather ideas for an updated program plan. Program staff estimate that, on average, only about one new project is selected every other year (and a similar number are shut down). Relatedly, the Program does not receive large numbers of new proposals, nor does it typically issue RFPs or solicit proposals in other ways. (Often, the technology of interest does not yet exist, though the science may be well understood.) Finally, criteria for project selection and criteria for project review often merge; put differently, selection of areas for priority technical development generally flow from assessments of progress to date.

In short, the selection and review processes in the Proliferation Detection Program are both closely linked and highly iterative, and depend upon regular interactions among NN-20 staff, key lab investigators and managers, and representatives of the user communities. Program managers describe these interactions as consisting of several general steps:

• *identify and characterize the detection problem.* Overall R&D priorities reflect regularly scheduled meetings with users (e.g., MASINT committees and others), as well as broader national-level guidance.

• *determine "attack vectors"*--that is, identify technology areas of particular promise for addressing the detection problems. These do not usually change greatly from year to year (though priorities can and do evolve). Technological opportunities are identified through regular discussions with the national labs. Assessments of technology thus often have a large impact on the Program's R&D priorities.

• *develop an "end-to-end" project.* As noted above, the Program supports a few large projects, in multi-year efforts with multi-agency participation. Typically, the project plan will encompass work in signatures, phenomena (e.g., the physics of signature propagation), sensor science and sensor engineering, data analysis, and support to systems implementation. Program staff stress that these are not separable components which can be handled through RFP arrangements and then selected by independent review; rather, the parts are inter-dependent, and must be selected and reviewed as such.

• *review/retire/replace.* Again, Program staff meet regularly with lab personnel and the users (e.g., through quarterly meetings of the Program's "Partnership Panel") to consider questions like the following: Are there new "attack vectors" of particular promise? Is the project's overall

R&D strategy still valid? Are there other approaches that might be better? Is the project still important (i.e., does it still respond to national priorities)?

Though the results of these processes are usually incremental, the on-going reviews do sometimes produce major program decisions. One example--illustrative of how the review and selection processes in this Program inevitably tend to merge--concerns the Thermal and Spectral IR (TASIR) project. TASIR derived from a determination in 1993 that high-resolution imagery spectroscopy was a particularly promising area for technology development (that is, it was identified as an "attack vector"). By 1996, however, after on-going project reviews, a combination of DOE, laboratory, and user personnel concluded that the program was not meeting its objectives--that imaging spectroscopy was still of interest, but TASIR was not a fruitful approach. As a result, a new approach was developed, which became a hyperspectral infrared imaging system.

C) PROLIFERATION DETERRENCE

1) Nuclear Materials

Roughly half of the Nuclear Materials program serves law enforcement customers. The roles and tasking for these efforts have been specified in MOUs between DOE and the Departments of Treasury and Justice and the FBI. In response to these agreements, the FBI has published requirements and technical goals for research activities as part of program announcements in the Commerce Business Daily. In response to the first announcement in FY 1998, the National Laboratories responded with 225 proposals. The FBI selected 27 of these to be carried out under the "work for others" program at the Labs.

A separate proposal call, via NN-20, came from the FBI Hazardous Materials Response Unit for technologies to prevent use of weapons of mass destruction. There were 79 lab proposals, with 10 being funded. As specified in the MOUs, NN-20 plays a role to manage this research effort that is funded by the FBI.

At the same time, NN-20 funds the National Labs to carry out research that is consistent with the FBI's requirements. Proposals for this work are submitted to NN-20, and they are sent to approximately three external (non-DOE) experts for consideration. The review criteria include technical quality, potential contributions from the research, and feasibility of the proposed work plan (see attached review form at Appendix C). Selection is based on a ranking from these reviews.

In addition, the Nuclear Materials program funds research on detecting the signals from proliferation activities. These proposals from the National Laboratories are reviewed and ranked by the Air Force Technical Applications Center. In general, the project selection follows this AFTAC guidance.

2) Microtechnologies

The project selection process for the Microtechnologies (MT) Program combines informal and formal elements. Program managers travel to the national laboratories several times per year, meeting with lab staff to gather information, opinions, and suggestions about current and future work. PIs and program managers at the labs also come periodically to NN-20, to make informal proposals and solicit information about new priorities. NN-20 staff describe these interactions as "iteration and negotiation," aimed at drawing on the technical expertise at the labs to identify promising ways to responding to the generally-stated requirements contained in PDDs and other guidance.

The formal Call for Proposals is linked to the yearly NN-20 budget process. The Call is distributed to all lab personnel, and sets out NN-20's main priorities for the coming year (as well as schedule and formatting guidance). The Call does not usually convey specific technical requirements; rather, these are communicated by NN-20 through the rounds of informal discussion with lab personnel.

Project proposals for the MT Program tend to range from about $200,000 to $1 million or more per year. They are reviewed by the MT program manager, according to two main criteria: (a) technical excellence (e.g., the credentials and track record of the PI; technical credibility of the project, including the feasibility of the goals; clarity of the work plan; etc.; and (b) the relevance to program priorities, or mission areas (that is, the extent to which the project addresses technical needs of the Program. As noted above, the technical requirements are often communicated to the program manager by the NN-20 Director and other senior staff; they can sometimes be quite specific (e.g., that there is a need for a small, hand-held sensor to measure a given phenomenon). There is also another, subsidiary criterion, resulting from the need to balance the funding to the scope of the work. That is, given the overall funding constraints, can the project produce a useful result for the funding that can be made available to it?

Assessments of on-going project work also have several components. As noted above, all NN-20 projects are required to submit quarterly reports, supplemented by personal contacts, and each project is given one formal program review per year. PIs understand that funding can be re-programmed--increased or decreased--during the year.

It should also be noted that funding is done on a yearly basis. But most projects in the MT program are multi-year efforts; hence, a project "review" is an inherent adjunct to re-funding decisions.

3) Radiation Detection

As with other programs, the input from the Radiation Detection Program to the NN-20-wide Call for Proposals is derived by the program manager from broad policy guidance (described above), interagency discussion and guidance, and discussions with laboratory personnel, and university and industry representatives. In addition, a Radiation Detection Panel, consisting of DOE laboratory specialists and funded by Program money, serves as an *ad hoc* advisory board.

For out-of-cycle proposals, "White Papers" outlining proposed projects are submitted by DOE labs and by outside sources to NN-20 for consideration.

Most proposals come from the labs (having undergone internal, lab review). Program managers evaluate these for relevance and usefulness to mission needs. They will frequently solicit expert advice from Radiation Detection Panel, as well as from other experts within and without the US Government. In addition, contractors may be hired to support the expert review process. The result is a set of prioritized recommendations to NN-20 management about which proposals should be funded. The lab PIs are sometimes asked to change project plans either to focus more directly on specific issues or to downscale planned work consistent with resource constraints.

The Program manager is responsible for on-going project reviews. Projects are reviewed annually in the field, and the Program manager will also visit the relevant labs at least twice annually to assess progress. Reactions will sometimes be solicited from informed representatives of the user community as well, and members of the Radiation Detection Panel may be asked to conduct reviews of specific bodies of work. Projects deemed (by NN-20) of particular concern may have a review committee appointed to evaluate them. This panel, comprised of USG and outside experts, conducts periodic reviews of the project and its progress. (No such committees are currently in operation for Radiation Detection Program projects.)

4) Counter-Nuclear Smuggling

Because the Counter-Nuclear Smuggling Program was defined as such specifically to respond to needs of other agencies (Customs, the FBI, etc.), important aspects of its review and selection processes reflect a heavy use-needs focus. The MOUs agreed with these agencies are fairly specific in defining requirements for program planning and review. Any projects that propose to undertake prototype development require expressed user interest to go forward, as well as an outside (non-DOE) merit review, which must include the prospective user. Applied research projects may be subject to a positive inter-lab peer review, to demonstrate technical merit, prior to NN-20 approval.

Also, because Counter-Nuclear Smuggling lacks unique funding of its own, all projects undertaken under its auspices are subject to the processes and procedures of one or more other NN-20 programs, whose program funds support them. At the prototype stage, the user may contribute funding as well.

D) CHEMICAL AND BIOLOGICAL NONPROLIFERATION

The Chemical and Biological Nonproliferation Program has two distinct efforts: the Technology Development Initiatives, and the System Integration Initiatives. These differ significantly in both size and complexity; consequently, different methods for selection and review are used for each. Additionally, since the Chemical and Biological Nonproliferation Program is relatively new, some of its review processes have changed each year. The short summary below describes both the most salient history and also the current and planned review methods that are used within the program.

1) Technology Development Initiatives

The selection processes in this area have evolved considerably over the past three years, along with the Program itself. Program managers intend that the most recent method will continue to be used in the future, without more large-scale changes. The most recent method consisted of a two step process, separately assessing operational worth and technical soundness.

First, short "white papers" were solicited from the national laboratories on ideas for new projects. These white papers were then judged on their potential "impact," or the potential operational utility of a proposed technological development. This judgment was made by the three Program Managers, based on their experience gained in overseeing the entirety of the program. About a third of the white papers survived this review, and proposals were requested for each.

Second, those proposals were then sent through an external peer review process orchestrated by the Oak Ridge Institute for Science and Education (ORISE). The ORISE process is also used for proposal evaluation by the Office of Biological and Environmental Research within the DOE Office of Science. This stage of the review process was external in the sense that none of the participants were drawn from the national laboratories.

The peer reviewers were asked to estimate three factors which were aggregated into a single score: user impact, scientific and technical soundness, and management and execution plan. In the future, the impact criterion may be evaluated by a different external group from the scientific peer group. For the most part, final project selection tracked review scores; however, programmatic considerations also influenced the final portfolio.

Earlier methods of selection differed in two interesting dimensions. First, most lacked an explicitly external peer review for technical and managerial soundness. Such judgments were made by representatives from the national laboratories. Second, the earlier methods estimated the utility to potential users differently. In an early process, this estimate was informally arrived at in a round-table discussion of the proposals, involving available representatives from the Departments of Defense, Justice (FBI), Health and Human Services, and Transportation, the Intelligence Community, and others. In a subsequent process, used only for redirecting the detection initiative, explicit scenarios of domestic attacks, developed by a team of systems analysts from several national laboratories, were used to analyze the potential utility of proposed developments. The selection process will continue to undergo modifications, but the intent is to continue to use external peer review, at least for the scientific and technical evaluation.

Reviews of all on-going projects are held every three to four months. The method is to convene a meeting involving all the Principal Investigators for one Initiative for about one day. The meeting rotates around the involved laboratories. This serves both to communicate the status of each project, and also to increase the communications across the laboratories. Typically, in addition to DOE laboratory personnel, only the Program Managers have attended these meetings. The exception is the yearly overall program review, which draws a wider audience, extends over three days, and serves as one of the quarterly reviews for each initiative. Current plans are to invite selected external experts to the regular review meetings.

2) System Integration Initiatives

The System Integration Initiatives are large-scale demonstrations of technology in an operational setting. A potential user from outside the Department of Energy is heavily involved in the design and execution of both of the existing initiatives, and that is planned for any future ones as well.

The two current initiatives evolved from studies done by laboratory teams looking at user applications of technology and were selected informally by the Program Managers. These two existing initiatives, or Domestic Demonstration and Application Programs as they are sometimes called, are: 1) PROTECT (Program for Response Options and Technology Enhancements for

Chemical/Biological Terrorism), which is designed to detect the release of a chemical weapon within vulnerable fixed infrastructure (e.g. subway, airport) and to improve the operational response; and 2) SCMIS (Sentry and Consequence Management Information System), which is designed to provide the detection of the release of a biological agent during a specific event (e.g. sporting event, political gathering) and to aid the response to the release.

The plan for the Chemical and Biological Nonproliferation Program envisions significant growth in such initiatives within the next five years. The most recent solicitation for new initiatives generated only one proposal, on decontamination, which was deferred. No review and selection process has been chosen to assess the potential of such proposals in the future, although the Program Managers intend the user dimension to play a significant role.

The review process for the System Integration Initiatives is just being designed, as the initiatives are still rather new. The Program Managers expect to convene a panel or advisory board for each initiative, and review each initiative about three times a year. The panel would provide technical oversight, but would primarily consist of potential users similar to those already involved; for example, PROTECT's panel would include representatives from transit systems not involved in PROTECT. The boards would advise the Program Managers on whether the initiatives were producing systems likely to be widely used. The detailed composition of these boards, the details of their operation, and the usefulness of their comments must await their creation.

<u>Attachment to Appendix E: Budget Guidance</u>

March 11, 1999

MEMORANDUM FOR DISTRIBUTION

Subject: **FY2000 Project Lifecycle Planning, Program and Outyear Budget Guidance**

Project Lifecycle Plans will be due April 15, 1999 to the Office of Research and Development (NN-20). Please include a cover letter, which lists, in your laboratory's priority order for FY 2000, a combined listing of your new proposals and currently funded projects. Updates to currently funded projects should be submitted as electronic (see Enclosure 1) markups of the existing Project Lifecycle Plans. We request that you distribute this guidance within your organization(s) to all personnel who may be involved with the preparation of Project Lifecycle Plans or the Budget, and ensure that we receive a consolidated submittal from the Laboratory.

<u>PROGRAM GUIDANCE</u>

Enclosure 2, *Program Guidance FY2000/2001 and Beyond*, describes plans for continuing our currently funded programs as well as identifies a number of potential areas for new initiatives. We are always interested in evaluating new initiatives or better ways to approach long standing high priority mission research areas. Accordingly we encourage you to "float" new ideas to us at any time that you have them.

However, recognizing that if we were to decide to fund any of these ideas, the practical matter of integrating them into the Project Lifecycle Plans associated with a particular funding cycle suggests a few efficiency measures should be observed. Please **use an appropriate subset of the information fields** that will be eventually required in a funded Project Lifecycle Plan. We suggest this would consist of (see Enclosure 3 for format and content), the front page, the "Proposed Work and Scientific Basis", the "Research Issues" and the "Tasks and Associated Technical Deliverables". Also, **the earlier in the annual funding cycle that you float a new idea, the easier the integration into the funding cycle**. If you float an idea between October and February you will likely get feedback sufficient to help you include the idea properly into the Project Lifecycle Planning process with the least amount of iteration or extra paperwork. If you float an idea at the same time as Project Lifecycle Plan submittal, you will probably only get a yes/no answer in the June timeframe in the overall ranking sent to the labs. If you float an idea in the July to September timeframe, it will most likely end up in the pile of unfunded ideas for consideration in the next funding cycle unless it is substituted for some other ongoing work. Finally, due to the consolidated approach we have take to Project Lifecycle Plans in recent years, a new initiative may end up as a new task in an ongoing Project Lifecycle Plan rather than as a separate one. If you propose or anticipate this to be the case, please **specify in which ongoing Project Lifecycle Plan the new idea should included.**

<u>OUTYEAR BUDGET GUIDANCE</u>

Once again we continue to look at a constrained budget environment, with a decline in some program areas. While overall program dollars are requested to increase slightly, the increase in Chem/Bio and the addition of a Construction project will cost more than the increase, resulting in a decrease to other program areas. The challenge is to continue to support our other missions and customers while looking for a few new opportunities.

Consistent with our reduced budget reporting requirements, a separate Field Budget Submission from the Operations Offices to the Chief Financial Office (CR) is not required for our programs. We will prepare outyear budget formulation for CR. Our ability to justify maintaining the projected level of funding relies heavily on the outyear projections in the Project Lifecycle Plans. Therefore, please ensure that your proposals (i.e., Project Lifecycle Plan submissions) show **complete lifecycle** information, **<u>especially for the budget for FY 2001</u>**, whether they are a continuation of currently funded projects or new outyear initiatives.

Attachment to Appendix E: Budget Guidance

FORMAT AND CONTENT OF PROJECT MANAGEMENT DOCUMENTS

Enclosures 1, 2, 3 and 4 are guidelines and examples of project management documents each principal investigator needs to be aware of and submit to the laboratory point of contact if necessary. The table below summarizes from whom the documents are required and when. Each of these documents has a standard format and content as shown in the enclosures. Technical reports should be submitted as separate deliverables and not attached to quarterly progress reports. Also, any document which is classified should be submitted as a separate document, and should not be attached to any other document, not even one related to the same project.

PROJECT MANAGEMENT	REQUIRED FROM	DUE DATE	ADDITIONAL GUIDANCE/ EXAMPLE
Project Lifecycle Plan	Each laboratory point of contact for each of their projects in PMIS	April 15, 1999	Enclosures 1, 2, 3 and 4. Classified Project Lifecycle Plans should be avoided, if at all possible.
Quarterly Progress Reports	Each laboratory point of contact for each of their projects in PMIS	20th of the month following each quarter	Enclosure 5

For Project Management Information System (PMIS) purposes, a project is defined as anything that is assigned a unique Department of Energy (DOE) PMIS project number and has funding and a corresponding Project Lifecycle Plan. Although we occasionally fund activity oriented projects, product oriented projects are preferred as they typically have a defined user and appropriate endpoint; the level of funding may vary substantially from year to year, consistent with which part of the development lifecycle is planned for which year.

Project Lifecycle Plans for projects we are funding by NN-20 in FY 1999 will be forwarded (electronically) to the laboratories under separate cover. **These should be reviewed by the principal investigators, marked (as outlined in Enclosure 1) with any updates/changes and returned by April 15, 1999, at the same time that new proposals are electronically submitted by the laboratory.**

DO NOT RETYPE Project Lifecycle Plans for currently funded projects **that are already in** the PMIS database. **INDICATE CHANGES** on your April 15, 1999 submission **by following the procedures outlined in Enclosure 1**. It is critical that changes be highlighted this way to focus negotiations with the DOE program managers on the changes to the statements of work as well as to enable PMIS updating.

Please identify one individual from your organization to work with NN-20 on the electronic version of the Proposal/Project Lifecycle Plan (Enclosure 4). Questions regarding Project Lifecycle Planning and Outyear Budget guidance should be directed to NN-20. The electronic versions of the Proposal/Project Lifecycle plans should be sent via e-mail to NN-20.

Robert E Waldron, Director
Office of Research and Development
Office of Nonproliferation and National Security

Attachment to Appendix E: Budget Guidance

Enclosures:
1) Electronic Submission of Proposal/Project Lifecycle Plans
2) Program Guidance FY2000/2001 and Beyond
3) Sample Proposal/Project Lifecycle Plan
4) NN-20 2000 Program Grouping Guidelines
5) Checklist for Quarterly Progress Reports

Distribution to Points of Contact at:

Albuquerque Operations Office
Ames Laboratory
Argonne National Laboratory
Brookhaven National Laboratory
Chicago Operations Office
CR, Department of Energy
Environmental Measurements Laboratory
Idaho National Engineering and Environmental Laboratory
Idaho Operations Office
Los Alamos National Laboratory
Lawrence Berkley Laboratory
Lawrence Livermore National Laboratory
Nevada Operations Office
Oak Ridge National Laboratory
Oak Ridge Operations Office
Oak Ridge Y-12 Plant
Oakland Operations Office
Remote Sensing Laboratory
Pacific Northwest National Laboratory
Richland Operations Office
Sandia National Laboratories
Savannah River Operations Office
Savannah River Technology Center

Attachment to Appendix E: Budget Guidance

ELECTRONIC SUBMISSION OF PROJECT LIFECYCLE PLANS

We will distribute to the laboratories **miniPMIS**, an abbreviated version of the project management database program **PMIS *Plus,*** which will be used to enter or modify only the "first page" information of the Project Lifecycle Plan.

The rest of the project data: narrative, statements of work, deliverables and milestones will be entered or modified using Microsoft Word (version 6.0 or higher). The "Track Changes" feature in MS WORD will be used to identify changes made to the Narrative and Statements of Work for the currently funded projects. This feature will automatically "strike through" words/sentences that are deleted; and underline words/sentences that have been added. Instructions will be included with the **miniPMIS** program (under separate cover). Also, an important change is that the upcoming technical deliverables need to be moved into the Statement of Work to facilitate electronic uploading. Please list them in chronological order under the Task from which they will be produced. Also continue to use the "deliverables format" described in the proposal guide. Management deliverables will be entered in the Deliverables fields by DOE/HQ data entry personnel for the current year.

All Proposals/Project Lifecycle Plans are to be submitted "electronically" via e-mail. The files may be compressed by PKZIP or similar program, and sent to XXXXX@hq.doe.gov.

The minimum recommended hardware configuration to run the **miniPMIS** program is an IBM compatible PC running Windows 95/98/NT and Microsoft Word 6.0 (or higher). The miniPMIS program should be installed on a **network** drive, so that it will be accessible from any IBM compatible PC connected to the network.

If you have problems or questions, please contact NN-20.

Attachment to Appendix E: Budget Guidance

PROGRAM GUIDANCE
FY 2000/2001 AND BEYOND

NUCLEAR TEST TREATY MONITORING

GROUND-BASED MONITORING initiatives are well underway in the technology areas of the proposed CTBT International Monitoring System and our planning assumptions are geared to fulfilling these initiatives. In the seismic area, we are transitioning from compiling existing information into a structured data processing form to collecting new data through calibration experiments. In the hydroacoustic area, calculational studies in support of station installation are proceeding at a low support level, and will continue at that level. In the radionuclide area, major hardware deliveries were completed in FY 98. Out year funding will focus on software and operational support to assure user success through the commercialization process. Similarly, infrasound hardware delivery to the procurement process is scheduled to occur in FY99, and the out year funding will be on research to reduce false alarms through signal processing. In the year 2000 and beyond, funding will be redirected to calibration and operational support to assure that our R&D investment actually reaches implementation. The period of support is dependent on actual dates of ratification and treaty entry-into-force, as well as resolution of implementation issues as they arise.

U.S. NUCLEAR DETONATION DETECTION SYSTEM (USNDS) will continue to meet interagency commitments for production, launch support, and operational support of current generation USNDS satellite sensors. In anticipation of future changing national requirements, but constrained by DoD operational budgets as well as DOE research and development budgets, DOE/NN-20 will continue to evolve the USNDS sensor technologies. Specifically, DOE/NN-20 will: (1) develop, demonstrate, validate, and deploy new optical imaging sensors to improve atmospheric explosion detection sensitivity; (2) develop, demonstrate, and validate on-orbit and ground-based autonomous electromagnetic-pulse data processing techniques to ensure all-weather and second-phenomenology atmospheric explosion detection; (3) deploy extended-range x-ray sensors for high-altitude and space explosion monitoring coverage; (4) develop, demonstrate, and validate, minimal-cost neutron/gamma/space-environment sensors to provide detection and characterization of explosions in space; and (5) deploy NDS Analysis Package systems to provide enhanced satellite/ground data transfer capabilities.

New initiatives are being sought for the out years to apply technology to monitoring other treaties and agreements such as: STrategic Arms Reduction Treaty (START III), Biological Weapons Convention (BWC), Chemical Weapons Convention (CWC), and Fissile Material Cut-off Treaty (FMCT).

DETERRENCE AND DETECTION TECHNOLOGIES

NUCLEAR MATERIALS ANALYSIS PROGRAM (NMA). NMA will advance the state-of-the-art in the detection and analysis of activities that threaten the National Security and the Public Safety by chemical or nuclear means. The desired outcome of these R&D efforts is the application of better, faster, cheaper solutions to the collection and analysis of proliferation and terrorism threats associated with weapons of mass destruction (WMD). NMA addresses R&D gaps in five major areas:

1. Selection of useful signatures
2. Development of appropriate sampling methods
3. Development of new analytical instruments and improved procedures
4. Implementation of better forensic analysis tools
5. Evaluation of analysis strategies

While proposals in all of the above five areas will be given serious consideration, particular emphasis this budget period (FY 2000) should be given to developing better forensic analysis tools. Among the usual

Attachment to Appendix E: Budget Guidance

selection criteria (potential applications, user interest, perceived technical gaps, etc.), particular weight will be given to proposals that complement the current NMA R&D portfolio by either extending or leveraging off of currently funded research. Forensic analysis tools and the exploitation of non-nuclear signatures to determine attribution are also of special interest.

As in the previous year, greater weight will also be given to proposals emphasizing the development of "base technologies." Base technologies are concepts that provide a significant technological advantage and can be combined with other ideas and used in multiple ways. (Examples of two such "base technologies" are compact electrostatic precipitators and portable time-of-flight mass spectrometers.)

The user community this year has expressed particular interest in more fully automated gas and particle collection systems with *in situ* analysis capabilities. In addition, they are looking for novel ways to mitigate the problems associated with large chemical or particulate backgrounds and innovative ways to reduce per sample analysis costs in the laboratory. (More information on any or all of these needs will be furnished upon request.) Some technologies proposed in this program area may have applications for Countering Nuclear Smuggling. Proposals with this potential application should be so marked.

In support of DOE's Law Enforcement Initiative to address the science and technology needs of the criminal justice system, we are continuing to build upon the existing relationships between the DOE laboratories and the Federal, State, and Local law enforcement communities. We plan to provide technical support and non-redundant forensic analysis, develop technology and systems for combating crime, conduct long-term research and development, and provide specialized training. Research areas of particular interest include: reduction of casework burden, arson detection, questioned document analysis, physiological fluid sensors, and location and assessment of clandestine drug labs. In addition, we are encouraging partnerships between the DOE labs and regional law enforcement for development, evaluation, and validation of new forensic tools.

Finally, we will balance our R&D portfolio by considering a few high-risk ideas that are still in the proof-of--principle stage but have high potential to advance the state-of-the-art.

MICROSENSOR TECHNOLOGIES. The principal Mission of Microsensor Technologies R&D Program is to develop and test new sensors based on the commercial advances in mico and nano technology fabrication techniques. The goal is to (1) enhance international transparency in various arms control inspection and verification scenarios; (2) strengthen the U.S. capability to monitor proliferation activities associated with weapons of mass destruction; and (3) provide new technologies to protect national borders, cities, and critical facilities from transnational terrorist threats. The program will develop new monitoring capabilities for global nuclear programs and detection of unauthorized activities. The product from this investment will sensor systems that can be operated remotely and/or unattended, and/or that can be readily deployed on demand by U.S. government organizations. These technologies frequently have dual-use for arms control and nonproliferation applications, detection of terrorist activities, and safeguards and security monitoring.

Proposals are solicited for RDT&E for detection and sensor technologies that will lead to: (1) advanced discrete chemical sensors, arrays, and networks that will substantially enhance the detection of signature species in environmental samples indicative of nuclear, chemical, and biological weapons activities; (2) data fusion methodologies to interpret large quantities of data from heterogeneous sensor networks; (3) micro-technologies for near-real-time chemical analysis of signature species; (4) sensor systems for monitoring high-radiation areas and storage facilities; and (5) integrated systems for protection of national borders, cities, and critical facilities.

Total funding for the area is expected to be approximately the same as in recent years. Additional funding may be available through development of partnerships with operational users. While the majority of the funding will be allocated to continue existing multi-year projects, fundamental work to develop new

Attachment to Appendix E: Budget Guidance

innovative concepts and prototypes will also be supported. All proposals should portray an integrated lifecycle view of the technology that will lead to prototype capabilities on the order of three years or less. Fundamental work should show collaborations with applied work to lead to such prototype capabilities. The resulting enhanced operational capabilities should be clearly described. Proposals will be subjected to merit review and in some cases technical peer review.

RADIATION DETECTION TECHNOLOGIES (RDT) research and development provides the core U. S. radiation detection and characterization capability to maintain U.S. leadership in reducing the threat of nuclear weapons proliferation. This program provides the key radiation detection and characterization technologies within DOE and for all U.S. agencies to improve domestic and international safeguards, reduce exposure to radiation, develop algorithms, sensors, and methods to provide technology options to support arms control treaties and agreements, and develop supporting technologies through both basic and applied research. RDT supports the DOE Counter Nuclear Smuggling Program, the U. S. Customs Service, joint U. S. and international exercises, DOE laboratory collaborations with universities, and innovative research at small businesses, and it provides new technology in support of the International Atomic Energy Agency (IAEA). The funding level will be approximately the same level as FY 1999.

Areas of research and development will include, but not be limited to, room temperature, high resolution radiation detection materials, micro-electronics, algorithm development and improvement, imaginative integration of technologies, cryogenic cooling systems, information barriers, vulnerability assessments, long range detection of special nuclear material (SNM), integration of sensor systems for specific applications, concepts to detect/interdict nuclear materials (especially highly enriched uranium), and hand portable or transportable "smart" inspection systems. A "grand challenge" view is to develop the ability to detect radioactive materials in heavily shielded containers at remote distances.

The program will focus on innovative, sometimes high risk, concepts that have the potential to produce major break-throughs to increase sensitivity, resolution, range, and fieldability, and to simplify operations and the interpretation of data. Proposals addressing new and innovative concepts (Phases 1 and 2) are of high interest along with improved methods for arms control treaty verification. Proposals for field demonstration and prototype development (Phases 3 and 4) will also be considered when a user has been identified.

PROLIFERATION DETECTION

The Proliferation Detection Program is divided into three thrust areas: Effluent Detection, Physical Detection, and Detection Enabling Technologies.

1. *Effluent Detection* thrust develops improved methods of searching for, detecting, identifying, and quantifying effluent signatures related to proliferation activities. The Effluent Detection research thrust is currently composed of both passive and active spectral detection technology development.

2. *Physical Detection* thrust develops improved measurement methods for physical quantities (heat, panchromatic and multispectral images, topography, physical displacement) to locate and identify processes indicative of weapons proliferation. The Physical Detection research thrust is currently composed of four activity areas: Multispectral Thermal Imaging, Advanced Radar Systems, Optical and Laser Applications, and Advanced Radio Frequency Detection.

3. *Detection Enabling Technologies* thrust is currently composed of a collection of small, independent or loosely allied projects. Separation of some of these projects from the effluent and physical detection trusts is intended to prevent neglect in the pursuit of larger themes. Some projects are directed

Attachment to Appendix E: Budget Guidance

toward early exploratory development of innovative and unconventional sensor technologies that exploit physical phenomena that are not normally taken advantage of in remote sensing systems. Other projects are directed toward technologies (such as sensor data processors) that can be applied to a wide range of sensor systems or that combine the output of multiple sensor systems. This thrust is currently composed of two activity areas: Unconventional Sensor Concepts and Information Extraction Technologies.

EFFLUENT DETECTION. The long term goal of the Effluent Detection program is to develop technology that can detect, identify, and quantify effluents during a broad area search. This admittedly ambitious goal is broken down into three intermediate steps. The intermediate goals are to detect, identify, and quantify effluents when:

- A specific building is suspected to be engaged in proliferation activities.
- A specific industrial park is suspected to be engaged in proliferation activities.
- A specific industrial region is suspected to be engaged in proliferation activities.

The two major programs within this thrust area are CALIOPE and HIRIS. The CALIOPE program, as currently structured, will conclude in FY1999. The UV fluorescence lidar project within CALIOPE will continue on its current schedule. The primary passive hyperspectral program within this thrust area is HIRIS. The HIRIS project will complete its major milestone in FY1999, and further *hardware* development of this sensor is not expected.

During the current fiscal year, two planning efforts are underway that will serve to identify the specific areas of research and development that will be pursued in the Effluent Detection program over the next several years. The first planning effort is for a prototype lidar system that will be developed jointly with a user agency. Although the purpose of this project is to develop a prototype lidar, it will probably incorporate aspects of passive spectral sensing as part of the complete system. This planning effort should conclude in time to be incorporated into the initial lifecycle plan submission.

The second planning effort is a continuation of what began in FY1998 as the "Active-Passive Trade Study (APTS)." The purpose of APTS is to build an interlaboratory consensus as to the state and capabilities of NN-20 sponsored spectral sensing technologies. With this as a foundation, specific issues will be identified that require further research and development to allow us to meet the goals stated above. Building on what has been accomplished in CALIOPE and HIRIS (and other projects), the restructured effluent detection program will bring the best of both technologies to bear on the goals of the program in the most cost effective manner to achieve users' requirements.

PHYSICAL DETECTION. The *Multispectral Thermal Imager* (MTI) activity is not accepting new project submissions. The existing projects will be continued according to current plans. Following satellite launch in FY2000, the MTI activity will consist of three main components: Satellite Operations, Data Processing and Analysis Center (DPAC) Operations, and Ground Truth activities.

Current SAR activities will be continued as well as being expanded and consolidated into a single *Advanced Radar Systems* activity area. This area will develop hardware and exploitation technology to present practical and useful system solutions to existing and emerging problems of national importance. Such activity would include airborne testing to support algorithm development and validate utility, modeling and surrogate measurements to justify performance predictions, and, if cost effective, development of a demonstration/proof of concept prototype. A key aspect of such a prototype will be the transfer of know-how to system developers and operational support providers so that successful results from DOE sponsored R&D are readily available for user agency competitive acquisition.

A portion of this effort in Advanced Radar Systems will continue to emphasize advanced algorithms applicable to all SAR systems as well as novel hardware system development using airborne platforms. We consider science and technology developments in these areas to be of national value in their own right as well as to contribute to an essential expertise base that supports specific new SAR initiatives.

Attachment to Appendix E: Budget Guidance

We do not anticipate any major new initiatives in FY 2000 in the *Optical and Laser Applications* area. However, we are receptive to concept exploration that has potential for providing: unique techniques for foliage-penetration; three-dimensional imagery; alternative measurement techniques for physical parameters; and information complementary to other sensor systems. Prior activities in ultralow light level imaging have demonstrated passive methods for nighttime imaging that will reveal nighttime proliferation activities.

In the *Advanced Radio Frequency Detection* activity, we currently support a few small projects to develop capabilities that make use of radio frequency observables to detect or provide supplemental information about remote activities. New observables need to be found as potential indicators of proliferation. We intend to maintain a modest effort in this area for innovative and high-payoff R&D.

DETECTION ENABLING TECHNOLOGIES. The ongoing projects funded under the Detection Enabling Technologies area will be continued according to current plans; however, limited funds may be available to initiate small projects to develop innovative and effective computational technologies or to evaluate sensors that use currently unexploited physical phenomena.

It is highly likely that some future advancements in proliferation detection systems will be the result of the simultaneous application of multiple sensor types. DOE/NN-20 wishes to explore applications for multiple sensor technologies, such as radar, hyperspectral imagers, or lidar, that can be used to augment each other, to improve current detection systems, to provide wider area coverage of future systems, or to provide new detection techniques.

Much of the effort in the *Information Extraction Technologies* activity is now centered on the development of reconfigureable processors that utilize field programmable gate arrays. This involves the development of software environments and toolkits to facilitate their use, application of these processors in heterogeneous processor systems, and algorithms to apply the processor systems to wide band radio frequency and active/passive optical data. Another effort in this activity is directed towards development of fast, efficient versions of algorithms pioneered by the *Advanced Radar Systems* activity to enable operational exploitation of SAR data on affordable general-purpose desktop computers as well as massively parallel computers. This will make these unique capabilities more accessible to the general remote sensing community.

FORMULATING A VISION FOR THE FUTURE OF PROLIFERATION DETECTION

In the coming year, we will be reformulating our program vision and establishing our strategic goals for the early years of the new millennium. The rest of this section will summarize our initial ideas defining general areas of interest. We actively solicit any comments and suggestions that you may have that will help us to refine, expand or redirect these concepts. We will be meeting in the near future to work with you to develop strategic plans.

The current DOE sensor development activities have concentrated on the development of a unique set of prototype sensor systems to detect and identify suspected proliferation activities. Prototyping these sensors will absorb most of the Proliferation Detection resources for the next few years. We are reaching the point where the application of sensors currently under development will be sufficiently well understood so that their ability to provide significant advancement in proliferation detection will be demonstrated in the next 3 to 5 years. After that, significant resources will become available to fund projects to develop fully new sensor concepts. In the meantime, limited resources may be available to fund concept exploration or the initial development of innovative concepts to address the following concerns.

Sensor systems currently under development have small fields-of-view and result in low search sweep rates. We will need concepts for enlarging the field-of-view or otherwise increasing the search sweep rate. Alternatively, we are interested in the development of sensors that would "reduce" the size of the search area that confirmatory sensors would need to search. This would make the overall detection and

Attachment to Appendix E: Budget Guidance

identification processes more effective because of a significant reduction in the volume of data that would need to be processed by the confirmatory sensor systems.

The utility of current proliferation detection tools will deteriorate, as their nature and vulnerabilities become widely known. Camouflage, denial, and deception can certainly degrade our nation's ability to detect proliferation. We need new sensors that are more difficult to counter. New signatures must be exploited and methods must be developed to overcome denial and deception efforts. Furthermore, we must have tools that allow us to search beyond the large institutions of our traditional adversaries as the composition of the potential threat evolves.

The sensing systems that are now under development may cover large areas in very short periods of time with high spatial resolution using hundreds of frequency bands. As a result these systems will generate huge quantities of data. This enormous flow of data will cause immense problems for storage on-board, transmission, processing, display, interpretation, and archiving. This flow of data will have to be reduced to information useable by decision-makers who must make decisions about whether a proliferation event has occurred, the nature of the event, and what should be done about it. Present processing systems are incapable of handling such huge quantities of data. Innovative, unconventional, adaptive, efficient, and effective processing algorithms along with platform-deployable and ground-based, high-power processor hardware to implement them must be developed, if the full potential of tomorrow's remote sensing systems are to be realized.

Once information is extracted, it must be combined with information from other sources using data fusion and model-based techniques for detection, identification and characterization of targets. This approach should not only support post data collection assessment, but have significant value in queuing sensor systems that can provide additional information of the right type to detect proliferation activity. Effective application of multi-source data also requires the development of systematic data collection strategies. We will also be interested in methods to simultaneously use multiple sensors to improve the detection, identification, characterization, and monitoring of proliferation activities.

A key component of future R&D projects will be the preplanned migration of DOE technology to systems capability, including the transfer of know-how to industry to support eventual operational employment through competitive user agency acquisition. Our sponsored R&D should continuously advance the leading edge of science and technology for the purpose of advancing the state-of-practice within the broader US national security arena.

Attachment to Appendix E: Budget Guidance

OFFICE OF RESEARCH AND DEVELOPMENT, NN-20

PROPOSAL/PROJECT LIFECYCLE PLAN

PREPARATION GUIDE

[The purpose of this guide is to enable first time proposers to the Office of Research and Development, NN-20, to prepare a proposal which has the correct information content for proposal evaluation, and to facilitate updating currently funded projects.]

Attachment to Appendix E: Budget Guidance

U.S. Department of Energy (DOE)
Office of Nonproliferation and National Security (NN-1)
Office of Research and Development (NN-20)
PROPOSAL/PROJECT LIFECYCLE PLAN

DATE:

PROJECT NO.: * PROJECT STATUS: Awaiting Disposition

TITLE:

B&R CODE/DESCR: This data will be entered by NN-20.

HQ OFFICE: NN-20 LAB/CONTRACTOR:

HQ MANAGER: ** POINTS OF CONTACT: ***

FUNDING START DATE: 00/00/00
FUNDING COMPLETION DATE: 00/00/00
[these dates are entered by NN-20 at time of funding]

FUNDING HISTORY

	EXECUTED		PLANNED	
	OPERATING $	EQUIPMENT $	OPERATING $	EQUIPMENT $
FY 1999	0	0	______	______
FY 2000	0	0	______	______
FY 2001	0	0	______	______
FY 2002	0	0	______	______
FY 2003	0	0	______	______

PROJECT DESCRIPTION: (OFFICIAL USE ONLY)
[The project description is intended to succinctly express why it is worthwhile to invest in this project. Provide a brief summary of the project objective, application, product, method and value to a user. This description is used by NN upper management and provided to other agencies for research and development coordination. Please take extra care that this be well written and short (approximately 560 characters or 8 lines).]

PROJECT SUPPORTS: [Select the best one and no more than three from below****. NOTE: Do not enter Keywords that are not listed below.]

* Project numbers are assigned at each laboratory in coordination with NN-20. Contact your designated liaison to NN-20 for PMIS.

** Choose only one manager name: Michael O'Connell, Leslie Casey, Stephen Herrick, or Robert Waldron, corresponding to the closest Program Area (see Enclosure 4).

***** Enter up to 2 names, telephone numbers, and E-mail addresses, preferably the program manager first and a technical principal investigator second.**

**** Chemical/Biological Defense; CTBT; Management; NPT; Nuclear Smuggling; Special Nuclear Material Controls; START III; USG; and Law Enforcement.

Attachment to Appendix E: Budget Guidance

STATEMENT OF WORK (NARRATIVE)

Objective:
[State the objective of the project]

Application:
[Describe the product and how the product is to be used; address the anticipated value of the information obtained from the deployment of the proposed system relative to proliferation detection application or the treaty being supported; and address any operational considerations (e.g., fieldability, access, coverage, etc.) and whether the proposed system is scenario specific. Describe how the application would be achieved without the product of this project and how this product is better for the application than what is currently available.]

User(s):
[List the organizations that would use the product of the project and indicate whether or not the organizations have been contacted and have a declared interest.]

Prior Work:
[Summarize the current state-of-the-art in the field, including bibliographic references to pertinent reports and journal articles; then cite previous work done by the proposer that is directly relevant to this Project Lifecycle Plan.]

Collaborators:
[Identify any other government agencies, University or industrial involvement and/or planned partnerships (e.g., CRADAs); identify any additional sponsors whose contributions will directly affect the performance of this project.]

Work for Others:
[Specify proposal numbers and titles for related WFO projects.]

Proposed Work and Scientific Basis:
[Describe how the project will advance the state-of-the-art; describe what we will know that we don't now know; describe the scientific basis for the work; describe the expected new capabilities and quantify to the degree possible; describe the work that will be done during this project; comment briefly on staff requirements, capital equipment needs, unique expertise, capabilities, and facilities to be used, etc. as appropriate.]

Research Issues:
[List the technical issues that will be addressed during the project; include anticipated major technical hurdles and discuss current ideas for resolving them.]

Attachment to Appendix E: Budget Guidance

STATEMENT OF WORK (TASKING) FOR FY ____

During FY__* the following tasks** will be performed to produce the associated technical deliverables:

Task 1.
[Describe task 1 and specify a dollar amount]

*** Deliverables (see format next page)
*** Milestones (see format next page)

Task 2.
[Describe task 2 and specify a dollar amount]

*** Deliverables
*** Milestones

[etc.]

EQUIPMENT $ JUSTIFICATION: [only items $25,000 and greater that will be capitalized]

* A separate task sheet should be filled out for each year proposed for the lifecycle of the project.

** Tasks are the major elements that a project can logically be broken into. Tasks are independent stages of a project and can proceed either sequentially or in parallel. Small projects may have only one or two tasks per year of funding.

*** List technical deliverables / milestones under the task that will produce them using the format shown on the next page.

Attachment to Appendix E: Budget Guidance

FY 20__* SCHEDULED DELIVERABLES:

[DELIVERABLES are: Physical products such as reports or hardware.

Two types of deliverables are tracked in PMIS: technical deliverables and management deliverables. Technical deliverables are to be defined by the proposer in the space below. Management deliverables (i.e., quarterly progress reports and updates to the Project Lifecycle Plan) will be automatically added into PMIS by the DOE/HQ data entry person. Do not add management deliverables at the lab. **Proposers should focus on identifying the technical deliverables.**

NOTE: Every project should have at least one __technical__ deliverable in the March-April time frame to assist DOE in the out year renewal process.]

DUE DATE COMPLETION DATE

/ / / /

___ sends DOE/HQ ______________________

/ / / /

___ sends DOE/HQ ______________________

.

.

etc.

FY 20__* SCHEDULED MILESTONES:

[MILESTONES are: Non-physical events, such as major decision points, briefings or presentations, or steps in the research process.

MILESTONES should be consistent with the Statement of Work, have scheduled dates and be representative of the research steps.]

SCHEDULED DATE

/ /

____

/ /

____

.

.

etc.

* Enter both milestones and technical deliverables for each fiscal year.

** Milestones and Deliverables __are not__ numbered; the PMIS orders the deliverables (and milestones) chronologically by due date and sorts them automatically when there are additions.

*** For each Milestone and Deliverable, a scheduled date or due date (month/day/year) MUST be entered.

**** Final reports should also be sent to the DOE's Office of Scientific and Technical Information (OSTI).

Attachment to Appendix E: Budget Guidance

U.S. DEPARTMENT OF ENERGY
OFFICE OF RESEARCH AND DEVELOPMENT, NN-20
FY2000 PROGRAM GROUPING GUIDELINES

The Department of Energy's Office of Research and Development (NN-20) has a Project Management Information System (PMIS) Program Grouping Report with a three position field to sort on Program Grouping. For program grouping, each project will have one (1) numeral from each level in the order A-B-C.*

					A	B	C
EXAMPLES:	SL200	SNL	Nuclear Material Analysis Program	=	1	1	4

LEVEL A – Funding

1 = Currently Funded	**2 - Proposed**	**3 – Awaiting Disposition**	**4 – Retired**	**5 – Will Not be Funded**

LEVEL B – Application

Michael O'Connell Program Manager	**Leslie Casey Program Manager**	**Stephen Herrick Program Manager**	**Robert Waldron Director**
1 = Detection and Deterrence Technologies Program	**2 = Treaty Monitoring Program**	**3 = Proliferation Detection Program**	**4 = Crosscutting Research and Development Activities**

LEVEL C - Program Groupings

GROUPING 1	**GC0401-01** General, Reserve	**GC0402-01** General, Reserve	**GC0403-01** General, Reserve	**GC0404-01** General, Reserve
GROUPING 2	**GC0401-02** Radiation Detection Technologies	**GC0402-02** Ground-Based Systems	**GC0403-02** Effluent Detection	**GC0404-02** Reserved, Lab Support*
GROUPING 3	**GC0401-03** Phase I	**GC0402-03** Satellite Instrumentation	**GC0403-03** Physical Detection	**GC0404-03** Reserved, SBIR/STTR
GROUPING 4	**GC0401-04** Forensics, Effluent Research, Nuclear Material Analysis		**GC0403-04** Detection Enabling Technologies	**GC0404-04** Chemical/Biological Weapons
GROUPING 5	**GC0401-05** Microsensors, Neural Networks			

*All Laboratory Support in one project under Waldron, along with tasks indentifying who they support.

Attachment to Appendix E: Budget Guidance

CHECKLIST FOR QUARTERLY PROGRESS REPORTS
QUARTERLY PROGRESS REPORT FOR THE PERIOD XXX-XXX, 19XX

PROJECT TITLE: (use same project title used in the DOE/HQ PMIS)

DOE/HQ PROJECT NUMBER: aaxxx LAB/CONTRACTOR: xxxx

B&R CODE: GCxxxxxxx DATE: (date quarterly prepared)

PRINCIPAL INVESTIGATOR(S): (name, organization, phone number)

HQ PROJECT MANAGER: (manager name, NN-xx, (202) 586-xxxx)

PROGRESS (BY TASK) DURING QUARTER: This should include:

- Statement of project progress on objectives,
- Statement of what was done during the quarter,
- Deliverable and milestone accomplishments/status; refer to deliverables and Milestones by their full title and NOT by their number, and
- Discussion of any technical difficulties or breakthroughs.

COMMENTS (BY TASK): This should include topics such as:

- Planned activities for next reporting period,
- Any changes in schedule of milestones or deliverables,
- Discussion of any anticipated funding shortfalls,
- Requests or recommendations,
- General remarks,
- Discussion of spending progress against the cost plan, and
- Problems.

FUNDING STATUS (BY TASK):

	OPER $	CAP $
UNCOSTED FROM PREVIOUS FY:		
CURRENT FY FUNDING:		
TOTAL FUNDING AVAILABLE:		
$ SPENT THIS QUARTER:		
$ SPENT YEAR-TO-DATE:		
$ REMAINING FOR THIS FY:		
ANTICIPATED UNCOSTED CURRENT FY FUNDS:		

TECHNICAL REPORTS/PRESENTATIONS (BY TASK):
Include such information as titles of reports worked on or delivered during the quarter as well as dates and locations of briefings, or presentations.

NOTE: Although classified quarterly reports may be submitted, HQ prefers that classified information be submitted as separate technical deliverables (e.g., letter reports) that can be referred to in the Quarterly. If possible, Quarterly Progress Reports should only be one page. If more information needs to be communicated, this should trigger the generation of a new separate technical deliverable. Do not attach, or incorporate, technical deliverables to Quarterly Progress Reports.

INTERNATIONAL NUCLEAR SAFETY

19. Senator LANDRIEU. General Gordon, how many reactors of the Chernobyl type are still operating, where are they, and what is NNSA planning to do about them?

General GORDON. There are 13 RBMK (Chernobyl type) reactors still operating. Lithuania's Ignalina nuclear power plant has two reactors. Eleven reactors are in Russia near her western border: four reactors at the Leningrad nuclear power plant located about 60 miles west of St. Petersburg, three reactors at the Smolensk nuclear power plant located about 250 miles southwest of Moscow; and four reactors at the Kursk nuclear power plant located about 300 miles south of Moscow.

There are also three plutonium production reactors which have a design similar to RBMK type reactors. They are located in Siberia, with two at Seversk and one at Zheleznogorsk. These reactors are even older and the least safe reactors in the entire former Soviet Union. These three plutonium production reactors are still needed to provide heat and electricity to the local communities until replacement power is available in about 2005–2007. The administration is considering the possibility of implementing projects to improve near-term safety at the plutonium production reactors until replacement fossil power becomes available.

Previously, the program has provided safety improvements in the areas of safety equipment upgrades, safety analysis, fire safety, and operational safety. For example: a safety parameter display system was completed at Kursk unit 2; an in-depth safety assessment was completed at Leningrad unit 2; fire safety improvements were implemented at the Smolensk plant; and at the Ignalina plant, excellent results have been achieved in upgrading the control and protection systems, installing safety parameter display systems, and implementing emergency procedures.

The program plans to continue with a limited set of projects to improve safety. Safety parameter display systems are being completed at Leningrad units 3 and 4. A project is underway to evaluate and mitigate pipe cracking problems due to intergranular stress corrosion cracking. Our planned support emphasizes the area of safety assessments in order to identify the weakest and highest risk components and procedures. An in-depth safety assessment is in progress at Leningrad unit 1, and a review of the Kursk unit 1 safety analysis is planned. At the Ignalina plant, we are providing limited technical assistance to complete a safety analysis for unit 2.

20. Senator LANDRIEU. General Gordon, the funds for these programs have been substantially reduced. What is the impact of the funding cuts?

General GORDON. The reduced budget means that the program must reorient toward fewer and smaller safety projects, and more limited interactions between U.S. and Russian nuclear experts. As a result, the program will have less impact on the safety of the RBMK plants than otherwise would have been the case. These funding levels cannot support implementing specific upgrades at all 13 operating RBMK reactors. Therefore, the program will complete more general safety culture upgrades such as improving quality control procedures, emergency operating instructions, and configuration management systems in order to have the widest possible impact on safety throughout the country.

In Russia, support for safety analyses will be limited, and no support will be available for safe shutdown evaluations or fire safety improvements (although they have been identified by international experts as key areas of concern). In Lithuania, we will not be able to fund any new safety projects, nor to provide any support for decommissioning.

Besides the 13 RBMK reactors and the three plutonium production reactors, there are 54 VVER type Soviet-designed reactors operating in Russia, Ukraine, Bulgaria, Slovakia, Hungary, and the Czech Republic. Many of these reactors need help to improve their safety systems, safety procedures, and safety analyses. We plan to provide very limited support to the Russian and Ukrainian reactors, but we will be unable to provide support to those in Bulgaria and other countries.

We feel the program may need to serve an increasingly important role, considering that Russia plans to continue to operate its older reactors, including the RBMKs. In addition, with nuclear power as a key part of our national energy plan, it is important to minimize the risk of nuclear accidents abroad, as they would adversely impact the prospects for nuclear power in the United States. We hope that despite a smaller program with fewer nuclear safety projects, we will be able to continue to have a meaningful impact on Russia's ability to improve its nuclear safety and infrastructure.

AVANGARD

21. Senator LANDRIEU. General Gordon, how do we know that the Russians are really closing the Avangard plant? We have heard that the plant workers are demanding that it not be closed.

General GORDON. It is not surprising that the plant workers do not wish the plant to be closed. Warhead production is what they know best and, like people everywhere, many of them wish to go on doing what is familiar to them. However, the Russian officials have reiterated in a number of public settings and private meetings their desire to close Avangard, a desire that makes sense in the light of post-Cold War realities. NCI worked directly with Avangard to reduce 10 percent of the facility by moving the security fence line. Such cooperation suggests that the Russians are serious about their plan to close Avangard.

22. Senator LANDRIEU. General Gordon, will we have any transparency into this process?

General GORDON. The best assurance of transparency is the continued involvement of the NCI program in Avangard's transformation. NCI officials and their laboratory contractors were the first Westerners to enter the Avangard facility. If NCI moves forward with its plans to develop businesses in the Avangard technopark, this will also help ensure both the transparency and irreversibility of the closure process. The NCI approach to Avangard is to convert more and more of the site for commercial ventures that provide alternative employment to weapons scientists. The site floor space has already been reduced by 10 percent and we hope to keep reducing it by steady increments.

23. Senator LANDRIEU. How will we know that they are not continuing nuclear warhead work? How do we know that the Avangard plant is not being used for a build-up in new tactical nuclear weapons?

General GORDON. The Avangard plant is the oldest of the four Soviet-era nuclear plants; it has been in operation the longest, and its physical plant is the oldest, which is why MinAtom has selected it for early shut-down. From a manufacturing point of view, Russia would have to undertake a massive retooling and re-equipping of the plant to make new warhead production possible. In essence, they would have to build a wholly new production line, which likely would be observable through alternative technical means.

At the same time, accelerating the decommissioning of the existing warhead production lines will remove Avangard permanently from nuclear operations. Restarting warhead work at a "clean" plant would be very expensive and time-consuming, and once Avangard is decommissioned, Russia would not be able to quickly restart operations there. Thus, providing NCI's work not only reduces the current Russian weapons through-put, but also makes it harder to increase the level of production at Avangard as a result of its reduced size.

24. Senator LANDRIEU. General Gordon, aren't the Russians emphasizing nuclear weapons as a way to compensate for the weakness of their conventional forces?

General GORDON. A debate has been ongoing in Moscow on this very issue, and it will probably be some time before we know its complete and final outcome. However, we do know that President Putin has lately made some significant decisions that point toward that outcome. Marshal Sergeyev, the former Commander-in-Chief of the Strategic Rocket Forces (SRF) and, in latter days, the Minister of Defense, had been the proponent of a nuclear emphasis in Russian military strategy. He was removed from his position in March, and is now serving as an advisor to President Putin. Just a few weeks ago, General Vakovlev, the Commander-in-Chief of the Strategic Rocket Forces, lost his job. The position was downgraded to a commander, the job was given to an individual who is not an expert on nuclear weapons, and the SRF was placed under the Army. In the meantime, Chief of the General Staff Kvashnin, who during the debate has been a proponent of modernizing and strengthening Russia's conventional forces, has seen his position strengthened. This seems to indicate that the Russians will be emphasizing conventional modernization, not nuclear weapons. However, I defer to the Intelligence Community for a more authoritative and detailed response to this question.

25. Senator LANDRIEU. General Gordon, what happens if we don't support efforts to shut down Avangard? If it's so bad, won't the Russians close it anyway without us?

General GORDON. Ending nuclear activities at this plant takes a significant amount of money and resources, both in direct and indirect costs. Russia may, in time, be able to accomplish the job, but not by the end of 2001, as they have said they would like to do. They have said that they are ready to begin downsizing their nuclear weapons complex, but that they would like our help in order to accelerate the process. From the outset, this has been a major rationale for NCI, and it has given us unprecedented opportunities to work inside the Russian nuclear weapons complex. At this point, a delay or halt in U.S. funding under the NCI would have the effect of sustaining Russia's capability to manufacture warheads at their current rate.

FUNDING DIVERSION

26. Senator LANDRIEU. General Gordon, is there any evidence that funds from the DOE/NNSA nonproliferation programs have been diverted to nuclear weapons development programs?

General GORDON. [Deleted.]

27. Senator LANDRIEU. General Gordon, is there good cooperation between the DOE programs and the intelligence community?

General GORDON. [Deleted.]

28. Senator LANDRIEU. General Gordon, NNSA has been responsible for canning the spent fuel in North Korea as part of the Agreed Framework. Is there any evidence that this material has been diverted?

General GORDON. There is no evidence to date that indicates North Korea has diverted any of the canned spent fuel. The canned material, slightly under 8,000 spent fuel rods, is currently stored under water in 412 canisters at North Korea's spent fuel storage facility in Nyongbyon, North Korea. The canisters have been sealed by the International Atomic Energy Agency (IAEA). The IAEA maintains a continuous monitoring presence at Nyongbyon, inspecting the seals on a recurring basis. In addition, continuous coverage is provided by IAEA surveillance cameras.

NUCLEAR CITIES

29. Senator LANDRIEU. Ms. Jones, establishing a climate attractive to western business is hard. Doing business there is more difficult there, is even more difficult than doing business generally in Russia.

How would you recommend attracting business to these sites, as opposed to just bringing some work to these sites?

Ms. JONES. As noted in our report, *Nuclear Nonproliferation: DOE's Efforts to Assist Weapons Scientists in Russia's Nuclear Cities Face Challenges* (May 3, 2001, GAO–01–429), there are numerous impediments associated with trying to start businesses in the nuclear cities. The nuclear cities are geographically and economically isolated, access is restricted for security reasons, and weapons scientists are not accustomed to working for commercial businesses. As a result, western businesses are reluctant to invest in the nuclear cities. However, the successful collaboration of a major U.S. computer firm in the Russian nuclear city of Sarov demonstrates what can be accomplished over time if the skills of Russia's weapons scientists are properly matched with the needs of business. This was the most successful commercial effort we observed in the nuclear cities and it has been undertaken without U.S. government assistance. This effort which began about 7 years ago employs about 100 scientists who have cut all ties to Russia's weapons institutes. The U.S. company representative responsible for developing this business effort told us that the key to establishing successful commercial ventures in the nuclear cities is to identify the skills and capabilities of the scientists and match their skills to the company's specific business needs. For example, the company determined which scientists in Sarov had math and science backgrounds suitable for computer software development. These scientists were then trained by the company in software development and hired away from the Russian weapons institutes. We believe that the approach followed by this U.S. firm makes sense and could be used by other companies seeking to employ Russian scientists. Furthermore, we believe that DOE can play an important role in identifying the skills and capabilities of scientists located in Russia's nuclear cities and facilitating contacts between the scientists and U.S. companies interested in hiring them.

30. Senator LANDRIEU. Ms. Jones, in your report, you suggest combining the Nuclear Cities Initiative with the Initiatives for Proliferation Prevention Program.

If this is done, what are the goals of the combined program?

Ms. JONES. As noted in our report, both programs already share a common underlying goal—the employment of Russian weapons scientists in alternative, nonmilitary scientific commercial activities. Scientists who are employed in sustainable nonweapons-related jobs will be financially able to move out of the weapons facilities which will assist in the downsizing of Russia's weapons complex—another goal of DOE's efforts. Russian officials we met with told us that they are judging the success of DOE's programs by one standard—the creation of sustainable jobs. These Russian officials have criticized those projects, such as community development projects, that do not lead to employment opportunities or provide sustainable jobs for weapons scientists. We believe that DOE needs to concentrate its limited financial resources on those projects that will most realistically lead to sustainable employment for weapons scientists.

31. Senator LANDRIEU. Ms. Jones, if NCI and IPP are combined, what legislative changes would be needed to the language governing the IPP program and the language governing the NCI program?

Ms. JONES. Both NCI and IPP operate under the same general statutory authority granted to the Department of Energy in 42 U.S.C. 5817(a), 42 U.S.C. 7112(10), and 42 U.S.C. 5813(9). No changes would be necessary to any of these statutory authorities. The authorization acts, however, contain different requirements and restrictions on the use of appropriated funds under each program. Section 3172 of the National Defense Authorization Act for Fiscal Year 2001 (P.L. 106–398) restricts the use of funds in the NCI program for the fiscal year. Section 3136(a) of the National Defense Authorization Act for Fiscal Year 2000 (P.L. 106–65) restricts the use of funds for the IPP program available in any fiscal year after fiscal year 1999. Some legislative alternatives for combining the programs are listed below.

1. Congress could act now and

(a) define the Initiative for Proliferation Program as including the Nuclear Cities Initiative activities.

Congress could add a definition section for IPP that incorporates the definition of NCI and transfers NCI 2001 appropriated funds to IPP, thus creating one program that would operate under current IPP authorization requirements and restrictions. To do this, Congress would also need to revoke authorizing language that refers to NCI; or

(b) enact more specific statutory authority, under which the combined program would operate.

2. Congress could wait and combine the programs in fiscal year 2002 authorization act.

Congress would set requirements in new authorizing language for the combined program.

32. Senator LANDRIEU. Ms. Jones, does your recommendation imply that there should only be an IPP program with its fairly narrow focus?

Ms. JONES. We would not characterize the IPP program as having a fairly narrow focus. The objectives of the IPP program are to (1) engage weapons scientists and institutes in productive nonmilitary work in the short term, and (2) create jobs for former weapons scientists in the high-technology commercial marketplace in the long-term. As noted in our report, IPP has funded over 100 projects in Russia's nuclear cities at a cost of over $13 million. The program also funds other projects at weapons institutes outside of the closed nuclear cities throughout Russia.

We believe that combining the IPP and NCI programs could result in a more effective and efficient consolidated effort incorporating the best aspects of both programs. As noted in our report, both the IPP program and the NCI program share a common underlying goal—the employment of weapons scientists in nonmilitary work—and there is not a clear distinction between the two programs. Combining the two programs could alleviate many of the concerns we have with the implementation of the NCI program. For example, the IPP program already has established limits on the amount of program funds to be spent in the United States and Russia as well as a strengthened project review and selection process. We believe that any consolidated effort should be flexible to allow for worthwhile projects initiated under the NCI program such as business training and development activities while concentrating on those projects that lead to sustainable employment for weapons scientists.

33. Senator LANDRIEU. Ms. Jones, the NCI program has an agreement governing how the Russian government treats programmatic funds for tax and other purposes, the IPP program does not. As a result, it works through the State Department-sponsored International Science and Technology Center (ISTC) or under the NCI agreement.

How important is this agreement to future efforts given Congress' concern about not having programmatic funds taxed?

Ms. JONES. While we believe the agreement is important, in our opinion, DOE could explore several options to avoid program funds from being taxed by the Russian government. For example, if the IPP and NCI programs are combined the government-to-government agreement between the United States and Russia for the Nuclear Cities Initiative can be renegotiated to accommodate the combined program. In addition, the IPP program seeks tax relief through the U.S. Civilian Research and Development Foundation—a U.S. nonprofit organization. Under this arrangement, IPP funds are transferred to the Foundation, which provides tax-exempt payments directly into the Russian project participants' bank accounts. DOE could explore whether this approach could also be used for all projects initiated under a program that consolidates the IPP and NCI programs.

[Whereupon, at 3:56 p.m., the hearing was adjourned.]

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 2002

THURSDAY, JULY 12, 2001

U.S. SENATE,
SUBCOMMITTEE ON EMERGING THREATS
AND CAPABILITIES,
COMMITTEE ON ARMED SERVICES,
Washington, DC.

COOPERATIVE THREAT REDUCTION, CHEMICAL WEAPONS DEMILITARIZATION, DEFENSE THREAT REDUCTION AGENCY, NONPROLIFERATION RESEARCH AND ENGINEERING, AND RELATED PROGRAMS

The committee met, pursuant to notice, at 2:18 p.m. in room SR–222, Russell Senate Office Building, Senator Mary L. Landrieu (chairman of the subcommittee) presiding.

Committee members present: Senators Landrieu, Roberts, Allard, and Hutchinson.

Majority staff members present: Madelyn R. Creedon, counsel; Evelyn N. Farkas, professional staff member; Richard W. Fieldhouse, professional staff member; and Peter K. Levine, general counsel.

Minority staff members present: Edward H. Edens IV, professional staff member; Mary Alice A. Hayward, professional staff member; and Joseph T. Sixeas, professional staff member.

Staff assistants present: Gabriella Eisen and Michele A. Traficante.

Committee members' assistants present: Menda S. Fife, assistant to Senator Kennedy; Erik Raven, assistant to Senator Byrd; Jason Matthews, assistant to Senator Landrieu; George M. Bernier III, assistant to Senator Santorum; Robert Alan McCurry, assistant to Senator Roberts; James P. Dohoney, Jr., assistant to Senator Hutchinson; and Wayne Glass, assistant to Senator Bingaman.

OPENING STATEMENT OF SENATOR MARY L. LANDRIEU, CHAIRMAN

Senator LANDRIEU. Good afternoon and let me welcome all of you to our Emerging Threats and Capabilities Subcommittee. I thank you for joining us this afternoon. I want to begin by thanking my most able ranking member, Senator Roberts, for his good work in this area, and look forward to working very closely with him as we did when our chairs were reversed. We have a wonderful relationship and will work closely together. I welcome our other members, Senator Allard and Senator Hutchinson. Thank you for your interest and your involvement in this important subject.

Let me just do one order of business before we start with opening statements. We welcome all of you as we said, but we had a slight problem this morning. We did not receive some of the written testimony in the usual, customary manner. So, I just want to, on the record, really encourage our witnesses to try to get their written material to the staff, which is very helpful to them in helping us to be prepared for the meetings. This is the second time today this has happened. Please be mindful of that for future hearings.

We are going start with our first panel. We have a lot to cover. This is the last of the Emerging Threats and Capabilities Subcommittee budget hearings this year. Due to the late DOD budget request, the ability of this subcommittee to hold more budget hearings has unfortunately been constrained. However, we are going to do the best we can under a tight timeframe and think we have done the best we could do.

As a result, we have a very full agenda to try to cover some of the matters that we were not able to cover before. We are here today to discuss the wide-ranging efforts of the Departments of Defense and Energy to address weapons of mass destruction.

Our witnesses today are Dr. Anna Johnson-Winegar, Deputy Assistant to the Secretary of Defense for Chemical and Biological Defense; Maj. Gen. Robert P. Bongiovi, Acting Director of the Defense Threat Reduction Agency; Dr. Susan Koch, Acting Assistant Secretary of Defense for Threat Reduction; and Robert Waldron, Assistant Deputy Administrator for Nonproliferation Research and Engineering at the National Nuclear Security Administration of the Department of Energy.

Today we will focus on the Cooperative Threat Reduction programs, commonly known as Nunn-Lugar, and the research and development efforts to assist both the warfighter and the wider community concerned broadly with weapons of mass destruction to detect, destroy, protect against, and stop the spread of weapons of mass destruction and weapons' usable materials. We will also discuss the U.S. efforts to destroy stockpiles of chemical munitions and stockpiles of chemical agents both in the United States and in Russia.

In January, a task force co-chaired by former Senator Howard Baker and former White House Counsel Lloyd Cutler concluded, "the most urgent unmet national security threat to the United States today is the danger that weapons of mass destruction or weapons' usable material in Russia could be stolen, sold to terrorists or hostile nation-states and used against American troops abroad or our citizens at home." This threat is real and our work today is important. The report went on to state that this threat is a clear and present danger to the international community as well as to American lives and liberties.

The task force concluded that much has been done by the programs that our witnesses here today represent, but much remains to be done. "Current nonproliferation programs in the Department of Energy, the Department of Defense, and related agencies have achieved impressive results thus far, but their limited mandate and funding fall short of what is required to address adequately the threat."

Today we would like to review many of those efforts to deal with this situation. We would like to understand where we have succeeded and where we have failed; how we can improve and the barriers left to achieving those results. Again, I welcome you all and look forward to hearing from each of you. I would at this time welcome any opening statement from our able ranking member, Senator Roberts, and then in turn the members who are present. After those opening statements we will hear from our panelists and then proceed to a round of questioning of whatever time will allow us.

Senator Roberts.

STATEMENT OF SENATOR PAT ROBERTS

Senator ROBERTS. Thank you, Madam Chairman. I would like to extend a very warm welcome to the witnesses this afternoon. Your work on the U.S. programs, as the chairman has indicated, that address the threats posed by weapons of mass destruction both at home and abroad represent some of our country's most important national security efforts. So, I want to thank you for your tireless work. I want to thank you for your dedication to this very critical mission. I want to thank you for the time and attention you have placed in preparing your remarks for this hearing. I know it is a tough job. As a matter of fact, we were working on my statement as of last night, so I stand guilty as you are. I look forward to receiving your testimony.

The subcommittee has had a tradition of holding hearings that examine how the United States is implementing programs designed to address the present and future threats to the United States. We have held hearings in the subcommittee on cyber threats and critical infrastructure protection, terrorism, weapons of mass destruction, civil support teams, nonproliferation and Russian threat reduction programs, science and technology research and development, and joint experimentation. That's pretty wide pasture. Our jurisdiction is indeed broad. These hearings have established what I hope is a solid record of accomplishment and challenges in meeting the emerging threats that face our Nation.

Today's hearing actually compliments the topics that the subcommittee has examined over the past 2 years. The programs we will hear about from you attempt to enhance U.S. strategic capabilities by developing and implementing technologies that give us the leading edge over known and potential adversaries, and provide the United States the ability to monitor arms control agreements. These programs combat threats posed by weapons of mass destruction either by improving security, as the chairman has indicated, or by eliminating the chemical, biological, and nuclear threats posed by these stockpiles. Finally, these programs augment the U.S. efforts to detect, deter, and protect vital national security interests to meet the challenges posed by the evolving threats of the 21st century.

I cannot stress enough how important this work is and what a great supporter I am of the mission and your work and your dedication. I hope today's hearings will illustrate that point. I am particularly pleased that we will have an opportunity to discuss the

U.S. chemical weapons demilitarization program. The $1.2 billion requested by the administration for this program will be necessary to support ongoing destruction operations, bring new facilities online, and ensure the safety of citizens in communities and towns adjacent to the destruction facilities.

This subcommittee has been very supportive of this program and I intend to maintain that tradition. I will note, however, that the U.S. chemical weapons program is not without its share of problems. There have been growing concerns about oversight and management of the program. Many members of this subcommittee, as well as Senators Shelby and McConnell, have been outspoken in this regard. Congress, through the work of this subcommittee, has repeatedly directed the Secretary of Defense to take a greater oversight role in this program.

Despite the public law that states that no one service will bear the financial burden of this program, the budget request for this program is included in the Army procurement account. That means that as a result, the decisions affecting Black Hawk helicopters, Abrams tanks, or M–16 rifles could impact or be impacted by funding for this program. Executing the chemical demilitarization program and meeting our obligations under the Chemical Weapons Convention is a national priority and should receive a commensurate degree of oversight from the Secretary of Defense. I am looking forward to hearing from Dr. Winegar on what steps have been taken to address these concerns.

Now we have received your budget request for fiscal year 2002. I hope you will be able to provide the subcommittee today with a clear and detailed discussion of how your budget request meets your mission and what you expect to accomplish with these requested funds. Shortly the subcommittee, as the chairman has indicated, will begin marking up the bill. I expect your testimony will contribute to the subcommittee's oversight role in the mark-up process, so we look forward to your statements and answers to your questions.

I would say again to the chairman, thank you for holding this hearing and this concludes my opening remarks.

Senator ROBERTS [presiding]. I would assume now acting as my role of chairman emeritus of the Emerging Threats and Capabilties Subcommittee, I would recognize the distinguished Senator from Arkansas.

STATEMENT OF SENATOR TIM HUTCHINSON

Senator HUTCHINSON. Thank you, Mr. Chairman. I will be brief. We have a vote ongoing so I will make this opening statement very quickly so we can begin receiving testimony. I want to thank you for being here. I want to thank the panel for their willingness to detail specifically the budget requests. As the chairman mentioned, the chemical demilitarization program should be a top national priority. Pine Bluff, Arkansas, the Pine Bluff Arsenal, is one of the prime sites of the Department of Defense chemical demilitarization program. So, I am very interested in the budget numbers regarding that program and, as Senator Roberts said, the oversight by the Department of Defense.

I will spend the bulk of my time during the questioning to discuss an issue that I think is very important not only to our national security but also to our force protection—that is the need for a vaccine production facility—a government-owned contractor-operated (GOCO) facility, the failure of the current program and the need to accelerate. I am disappointed that the administration only included $700,000 for this program. I think it needs to be accelerated.

There is an article in the *Chicago Tribune* that appeared just last week regarding two deaths that occurred at the Great Lakes Naval Training Center; two of our recruits died of viral infections. It has been linked to the failure to vaccinate these recruits and the cessation of the production of the vaccine that would have protected them back in the 1970s because the manufacturing company determined that they could not make money at it; that there was a very small demand for the product and therefore it was not profitable for them in terms of revenue. That is what commercial companies do and I think that is the compelling reason that if we are going to protect our men and women in uniform, we need to have a GOCO vaccine production facility. So, I am going to have a few questions regarding that.

I thank you for being here and I look forward to your testimony.

Senator ROBERTS. Senator, we have a vote that I did not realize that we would have so quickly and there are about 9 minutes left. I know the chairman wants to hear your testimony directly. I do as well. Usually we try to rotate back and forth in the interest of time, but we put you off so much now, I think you might as well sit back and relax for about 15 minutes and we will go vote. We will declare the subcommittee in a temporary recess until we come back from voting. We apologize. [Short recess.]

Senator LANDRIEU [presiding]. We thank you all for your patience. I appreciate it. We are going to wait just a moment because our members are very interested in the testimony. So, if everybody will just be at ease for a few minutes and they will be making their way back from this vote. [Pause.]

We thank you all for your patience. I believe Senator Allard has an opening statement.

STATEMENT OF SENATOR WAYNE ALLARD

Senator ALLARD. Madam Chairman, I do. In light of our being behind schedule, I am just going to ask permission that we put it in the record in its full context.

Senator LANDRIEU. Without objection.

[The prepared statement of Senator Allard follows:]

PREPARED STATEMENT BY SENATOR WAYNE ALLARD

Thank you Madam Chairman,

I want to thank all of you for coming here today. Cooperative threat reduction, nonproliferation research engineering, and chemical weapons demilitarization are areas of significant importance to the United States and the world. We saw today at the earlier ballistic missile defense hearing that the United States is working to assure our security on all fronts. Just as we prepare a ballistic missile threat defense, we must also prepare defenses for the other major threats of our times. Nonproliferation, cooperative threat reduction, and BMD are together a "defense in depth" and each area needs development.

The Cooperative Threat Reduction Program has had great success in reducing the number of ballistic nuclear missiles that can threaten us and our allies. Additionally, the National Nuclear Security Administration's Nonproliferation and Verification Research and Development Program has been successful at tracking and limiting the proliferation of nuclear threats. These endeavors coupled with our success in creating a robust missile defense system will certainly provide us a more secure world environment.

In 1997, the Senate agreed to ratify the Chemical Weapons Convention. Meeting the milestones prescribed in this treaty is critical to our reputation and our credibility on the world stage. The destruction process at the Pueblo Army Depot in Colorado has shown the *potential* to hinder our compliance to the treaty, but I will continue to insist that all responsible parties work to avoid this.

Thank you, I look forward to hearing today on the progress of these programs.

Senator LANDRIEU. Thank you, Senator. I think we are ready for our panelists to begin. Dr. Winegar, please proceed.

STATEMENT OF DR. ANNA JOHNSON-WINEGAR, DEPUTY ASSISTANT TO SECRETARY OF DEFENSE (CHEMICAL AND BIOLOGICAL DEFENSE)

Dr. WINEGAR. Madam Chairman and distinguished members of the subcommittee, I wish to thank you for the opportunity to appear before this subcommittee today to discuss the United States' chemical demilitarization program. I am Dr. Anna Johnson-Winegar, but for simplicity's sake, Dr. Winegar is fine for addressing. I am the Deputy Assistant to the Secretary of Defense for Chemical and Biological Defense Programs. My office is the single focal point within the Office of the Secretary of Defense responsible for oversight, coordination, and integration of the chemical and biological defense programs, counterproliferation support, chemical demilitarization, and assembled chemical weapons assessment programs.

Today I would like to highlight for you the major changes that the Department of Defense is implementing with regard to the United States chemical demilitarization program. As you well know, Mr. E.C. (Pete) Aldridge was confirmed as the Under Secretary of Defense for Acquisition, Technology and Logistics in the second week of May. On May 21, after examining concerns related to program cost, schedule and management, Secretary Aldridge directed that this program be categorized as an acquisition category 1D program. This change is intended to streamline future decisions and oversight authority. It is also consistent with the size and scope of this program, the international treaty obligations, and the level of local, state, and Federal interest in the safe and timely destruction of our Nation's chemical weapons stockpile.

In this capacity, Secretary Aldridge will oversee a defense-wide review that will provide him with a comprehensive assessment of our entire chemical demilitarization program. This defense acquisition executive review, and I will call it the DAE review, is an extensive and rigorous process that was initiated approximately 1 year ago when the Under Secretary of Defense for Acquisition, Technology and Logistics—Dr. Jacques Gansler at that time—directed this total review of all program components. This includes the chemical stockpile disposal, chemical stockpile emergency preparedness, alternative technologies and approaches, non-stockpile chemical materiel, and the assembled chemical weapons assessment programs.

As the status and future plans of each of these areas is examined, the following issues will be covered: The Chemical Weapons Convention compliance, life cycle cost estimates, program plans for closure of the stockpile facilities, and other organizational issues related to program management. This DAE review is scheduled to be held the first week of September.

Another important focus of this review is the need to select a destruction technology for the chemical weapon stockpiles stored in Pueblo, Colorado and Blue Grass, Kentucky. In accordance with Public Law 105–261, the Department is performing detailed assessments of the associated costs, scheduling, and safety of incineration and the alternative candidate technologies for those sites. This portion of the DAE review will occur in the spring 2002 timeframe in order for the technology decision to be made consistent with the final environmental impact statements and the subsequent records of decision for the Pueblo and Blue Grass sites.

In closing, I wish to reemphasize that the Department's intention to address chemical demilitarization program management issues underscores our commitment to strengthening and improving overall organizational effectiveness. Change has already begun at the top with future changes expected to positively impact different aspects at all levels of program management.

As we work our way through the DAE review, the Department will develop its recommendation for a decision on how to proceed in demilitarizing our Nation's chemical stockpiles. I welcome your comments on every aspect of how our program is proceeding. I also welcome the opportunity introduced by Senator Hutchinson to address his issues and concerns about the GOCO vaccine facility, which also falls under my purview.

I thank you again Madam Chairman and this entire subcommittee for inviting me to testify here today and I look forward to working with each of you to advance our common goals of the safe and complete elimination of our Nation's chemical weapons stockpile and the furtherance of our chemical and biological defense programs. Thank you.

[The prepared statement of Dr. Winegar follows:]

PREPARED STATEMENT BY DR. ANNA JOHNSON-WINEGAR

Madam Chairman and distinguished subcommittee members, I wish to thank you for the opportunity to appear before this subcommittee today to discuss the United States chemical demilitarization program. I am Dr. Anna Johnson-Winegar, Deputy Assistant to the Secretary of Defense for Chemical and Biological Defense. My office is the single focal point within the Office of the Secretary of Defense responsible for oversight, coordination, and integration of the chemical and biological defense, counterproliferation support, chemical demilitarization, and Assembled Chemical Weapons Assessment (ACWA) Programs.

RECENT PROGRAM CHANGES

Today I would like to highlight for you the major changes the Department of Defense is implementing with respect to the United States chemical demilitarization program. As you well know, Mr. E.C. (Pete) Aldridge was confirmed as the Under Secretary of Defense (Acquisition, Technology, and Logistics) in the second week of May. On May 21, after examining concerns related to program cost, schedule, and management, Secretary Aldridge directed that the program be categorized as an acquisition category-ID program. This change is intended to streamline future decisions and oversight authority. It is also consistent with the size and scope of this program, international treaty obligations, and the level of local, state, and Federal interest in the safe and timely destruction of our Nation's chemical weapons stockpile.

In this capacity, Secretary Aldridge will oversee a defense-wide review that will provide a comprehensive assessment of our entire Chemical Demlitarization Program. The Defense Acquisition Executive (DAE) review is an extensive and rigorous process that began approximately 1 year ago when the Under Secretary of Defense for Acquisition, Technology and Logistics directed a total program review. Subsequently, special panels consisting of cost, schedule and program analysts from the Program Manager for Chemical Demilitarization (PMCD) and PM ACWA were established and have met consistently for the purpose of conducting a review of each program component. This includes chemical stockpile disposal, chemical stockpile emergency preparedness, alternative technologies and approaches, non-stockpile chemical materiel and the assembled chemical weapons assessment. As the status and future plans for each of these areas is examined, the following issues will be covered: Chemical Weapons Convention (CWC) compliance, life cycle cost estimates, program plans for closure of the stockpile facilities, and other organizational issues related to program management. The DAE review is scheduled to be held the first week of September.

Another important focus of this review is the need to select a destruction technology for the chemical weapon stockpiles stored in Pueblo, Colorado and Blue Grass, Kentucky. In accordance with Public Law 105–261, the Department is performing detailed assessments of the associated costs, schedules, and safety of incineration and the candidate technologies for those sites. Our analysis also carefully considers public acceptability as a critical factor. We realize that we owe the communities our best, not necessarily the easiest, solution to the problem we face. This portion of the DAE review will occur in the spring 2002 time frame, in order for the technology decision to be made consistent with the final environmental impact statements and subsequent records of decision for the Pueblo and Blue Grass sites. The Draft Environmental Impact Statement for Pueblo was released May 9, 2001 with a 45-day public comment period that was extended an additional 45 days and will end August 8, 2001. The Blue Grass Draft Environmental Impact Statement is expected to be released by the first quarter fiscal year 2002.

PROGRAM STATUS

This year the chemical demilitarization program will enter a critical phase, with two new facilities scheduled to begin operational verification testing (systemization), and with Tooele chemical demilitarization facility continuing full-scale operations at our largest stockpile site. The state-of-the-art features at these facilities and ability to handle the throughput rates are unparalleled on a global scale. These efforts are indeed recognized by the international community as a major step towards continued compliance with the Chemical Weapons Convention (CWC) destruction deadlines. I am pleased to report that as of July 5, 2001, the United States had destroyed 20 percent of the stockpile that existed when the CWC entered into force 4 years ago. The interim deadlines set forth in the CWC require 20 percent destruction by April 29, 2002, putting us nearly 10 months ahead of the milestone.

FINAL REMARKS

In closing, I wish to reemphasize that the Department's intention to address chemical demilitarization program management issues underscores our commitment to strengthening and improving overall organizational effectiveness. Change has already begun at the top, with future changes expected to positively impact different aspects and levels of program management. As we work our way through the DAE review, the Department will develop its recommendation for a decision on how to proceed with demilitarizing our remaining chemical stockpile sites. I welcome your comments on every aspect of how our program is proceeding. I thank you, Madam Chairman, and this subcommittee for the opportunity to testify today. I look forward to working with you to advance our common goal of the safe and complete elimination of our Nation's chemical weapon stockpile.

Senator LANDRIEU. Thank you very much.

General Bongiovi.

STATEMENT OF MAJ. GEN. ROBERT P. BONGIOVI, USAF, ACTING DIRECTOR OF THE DEFENSE THREAT REDUCTION AGENCY

General BONGIOVI. Thank you. Madam Chairwoman and members of the subcommittee, I am Maj. Gen. Robert Bongiovi, the Acting Director of the Defense Threat Reduction Agency. I am pleased to have this opportunity today to testify on the mission of the agency. I would like to summarize my statement and request that it be included in its entirety in the record.

Senator LANDRIEU. Without objection.

General BONGIOVI. The Defense Threat Reduction Agency, commonly referred to as "DTRA", was established in October 1998 as part of the Defense Reform Initiative. The intent was to consolidate within one agency most of the DOD organizations executing weapons of mass destruction, or WMD-related missions, except for the Title 10 responsibilities of the services. This new, focused agency was intended to enhance overall Department understanding of the WMD threat and facilitate appropriate responses. Today, DTRA is far more than just the sum of its merging organizations. It is an innovative thinker and responder to the WMD challenge.

Before proceeding further, it might be helpful to define the term "weapons of mass destruction" or WMD. The definition encompasses nuclear, chemical, and biological weapons. However, it also includes radiological, electromagnetic pulse, and other advanced or unusual weapons capable of inflicting mass casualties or widespread destruction. In addition, conventional high explosive devices, such as those used in attacks on Khobar Towers and the U.S.S. *Cole*, are legally and operationally considered to be WMD.

Although the spectrum of our mission is large, it can be simply divided into four major functions: WMD combat support, technology development, threat control, and threat reduction. I will summarize each of these in my following remarks. The WMD combat support function provides operational and technical support to the Joint Chiefs of Staff, the warfighting commanders in chief, the CINCs, and the services to engage the threat and challenges posed to the United States, its forces, and allies by WMD. For example, DTRA provided targeting and consequence management support to the Joint Staff and a U.S.-European Command during Operations Desert Fox and Allied Force. In conjunction with the Commander in Chief, U.S. Strategic Command and the services, DTRA developed the first DOD Nuclear Mission Management Plan to sustain the U.S. nuclear deterrent in the years ahead.

At the direction of the Chairman, Joint Chiefs of Staff, DTRA will integrate threat reduction support and response capabilities into the warfighters' contingency plans, operational plans, and theater engagement plans. Also at the direction of the Chairman, DTRA performs as many as 100 force protection assessments of U.S. military installations at home and abroad each year. These assessments identify ways in which base commanders can improve their force protection posture. At the direction of OSD, we also perform more detailed balanced survivability assessments of critical facilities.

The technology development function develops, manages, and coordinates research and development activities underpinning other

DTRA functions. The DTRA technology development function includes programs to provide both offensive and defensive tools to the warfighter; develop technology needed to support arms control; manage nuclear weapons effects simulators and simulation; and develop radiation hardening of microelectronics for the protection of our weapon and space systems.

DTRA managed the Advanced Concept Technology Demonstration Program that developed the advanced unitary penetrator and hard target smart fuze used in Operation Allied Force in the former Yugoslavia. DTRA munitions effectiveness tools for the defeat of hardened/deeply buried targets and consequence management tools are in wide use. Among our top R&D priorities are improved tunnel and hardened/deeply buried defeat capabilities with emphasis on stand-off attack, faster detectors for chemical and biological agents, improved counterforce planning tools, and terrorist device defeat tools.

The third function, threat control, maintains U.S. technological security through policy execution, implementation of technology security programs, and compliance and enforcement. It includes inspection, escort, and monitoring missions to help ensure compliance with arms control agreements and new non-treaty means of threat control. Major accomplishments within the threat control function include the establishment of the congressionally-mandated program to monitor foreign launches of U.S. satellites; reengineering and revitalization of the DOD export control process; and successful completion of all arms control missions.

Finally the threat reduction function centers on the execution of the Cooperative Threat Reduction or "Nunn-Lugar" program. This program assists the eligible states of the former Soviet Union with the dismantlement of WMD and reduces the threat of WMD proliferation. Specifically, it destroys strategic delivery systems, stores and safeguards fissile materials, and improves safeguards for WMD materials and warheads.

Although our focus will remain on the warfighters, DTRA contributes to efforts to counter WMD terrorism at home. We share our WMD expertise with the Department of Justice, FEMA, the Center for Disease Control, and other Federal, state and local officials. DTRA also maintains an operation center that provides the warfighters and government officials on line access to a wide range of WMD expertise.

DTRA also assists interagency exercise planning. We have identified issues that national, state and local decision-makers would face should such an event occur. At the national level, we have worked directly and regularly with officials as senior as the Attorney General. Moreover, we have an important relationship with the Joint Forces Command's Joint Task Force for Civil Support. As a combat support agency, we offer planning, exercise, operational, legal, and public affairs support to this Joint Task Force.

I will conclude by noting that the Defense Department and Congress agree that WMD challenges continue to evolve and grow. DTRA is an important response to this threat. Our mission continues to expand. I thank you for your past support of DTRA and respectfully request your support for our fiscal year 2002 program. Thank you. I would be pleased to answer your questions.

[The prepared statement of Major General Bongiovi follows:]

PREPARED STATEMENT BY MAJ. GEN. ROBERT P. BONGIOVI, USAF

Madam Chairwoman and members of the subcommittee, I am Maj. Gen. Robert Bongiovi, the Acting Director of the Defense Threat Reduction Agency. I am pleased to have this opportunity today to testify on the mission of the agency. I would like to summarize my statement and request that it be included in its entirety in the record.

The Defense Threat Reduction Agency, commonly referred to as "DTRA", was established in October 1998 as part of the Defense Reform Initiative. The intent was to consolidate within one agency most of the DOD organizations executing WMD-related missions, except for the Title 10 responsibilities of the services. This new, focused agency would enhance overall Department understanding of the WMD threat and facilitate appropriate responses. Today, DTRA is far more than just the sum of its merging organizations. It is an innovative thinker and responder to the WMD challenge.

Before proceeding further, it may be helpful to define the term "weapons of mass destruction" or WMD. The definition encompasses nuclear, chemical, and biological weapons. However, it also includes radiological, electromagnetic pulse, and other advanced or unusual weapons capable of inflicting mass casualties or widespread destruction. In addition, conventional high explosive devices, such as those used in the attacks on Khobar Towers and the U.S.S. *Cole*, are legally and operationally considered to be WMD.

Although the spectrum of our mission is large, our missions can be simply divided into four major functions: WMD combat support, technology development, threat control, and threat reduction. I will summarize each of these in my following remarks.

The WMD combat support function provides operational and technical support to the Joint Chiefs of Staff, the warfighting commanders in chief, and the services to engage the threat and challenges posed to the United States, its forces and allies by WMD. Program activities include:

- Support for the planning, safety, security, and reliability of the nuclear deterrent;
- Warfighter support across the spectrum of threats and capabilities to include expanded support for CINC contingency plans, operational plans, and theater engagement plans; and
- Assessments of the vulnerabilities of U.S. military installations to terrorist threats.

DTRA WMD combat support has aided the Joint Staff and Commander, U.S. European Command with targeting decisions during Operations Desert Fox and Allied Force. DTRA has also developed, in conjunction with the Commander in Chief, U.S. Strategic Command, and the services, the first DOD Nuclear Mission Management Plan to sustain the U.S. nuclear deterrent in the years ahead. A top priority for DTRA at the direction of the Chairman of the Joint Chiefs of Staff is the integration of threat reduction support and response capabilities into the warfighters' plans—that is, providing them the offensive and defensive tools to prevail in WMD environments. Also at the direction of the Chairman, DTRA performs as many as 100 force protection assessments of U.S. military installations at home and abroad. These assessments identify ways in which base commanders can improve their force protection posture. At the direction of OSD, we also perform more detailed balanced survivability assessments of critical facilities.

The technology development function develops, manages, and coordinates research and development (R&D) activities underpinning other DTRA functions. It is important to understand that DTRA is an integrator and shaper of technology rather than a "bench science" R&D center. We reach out to wherever the needed technology exists, bringing together diverse ideas and capabilities, and shaping them into integrated R&D programs responsive to the needs of the warfighters. We rely heavily on a contractor base, including the DOE national labs, for the performance of the R&D we manage. As appropriate, DTRA either develops and delivers the final product direct to the customer, or provides the technology to the services or other appropriate organization for final refinement and fielding. Conceptually, we strive to dedicate 75 percent of our technology development to identified requirements while focusing about 25 percent on new concepts we can "push" to customers.

The DTRA technology development mission includes efforts to:

- Develop and test systems to characterize and strike WMD sites;
- Provide both offensive and defensive tools to the warfighter;

- Develop technology needed for DOD engagement activities involving arms control implementation, verification, monitoring, and inspection requirements;
- Manage nuclear weapons effects simulators and simulation;
- Develop radiation hardening of microelectronics for the protection of our weapon and space systems; and
- Provide electromagnetic pulse (EMP), radiation, blast, thermal effects data and related next generation technologies.

Products developed by DTRA have been used operationally. DTRA managed the ACTD that developed the advanced unitary penetrator and hard target smart fuze which were used in Operation Allied Force in the former Yugoslavia. Our munitions effectiveness tools are widely used for the defeat of hard and deeply buried targets. DTRA consequence management tools have also supported operations worldwide and are relied upon by domestic first responders to WMD events. Among our top R&D priorities are improved tunnel and hardened/deeply buried defeat capabilities with emphasis on stand-off attack, faster detectors for chemical and biological agents, improved counterforce planning tools, and terrorist device defeat tools.

The threat control function maintains U.S. technological security in three basic areas: policy, implementation, and compliance and enforcement. It includes inspection, escort, and monitoring missions to help ensure compliance with arms control agreements; and new non-treaty means of threat control.

Major accomplishments within the threat control function include the establishment of the congressionally-mandated program to monitor foreign launches of U.S. satellites; re-engineering and revitalization of the DOD export control process; and successful completion of all arms control missions.

The threat reduction function centers on the execution of the Cooperative Threat Reduction or "Nunn-Lugar" program. This program assists the eligible states of the former Soviet Union with the dismantlement of WMD and reduces the threat of WMD proliferation. Specifically, it destroys strategic delivery systems, stores and safeguards fissile material, and improves safeguards for WMD materials and warheads. Under this program, 5,580 strategic warheads have been deactivated, 428 ICBMs destroyed, 388 ICBM silos eliminated, 87 strategic bombers eliminated, 483 long-range nuclear air-launched cruise missiles destroyed, 20 ballistic missile submarines destroyed, 352 submarine ballistic missile launchers eliminated, 217 submarine-launched ballistic missiles eliminated, and 194 nuclear test tunnels and holes sealed.

DTRA performs these missions with 2,000 personnel primarily concentrated in northern Virginia and New Mexico. We also have people literally across the globe. The workforce is divided nearly equally between civilians and military personnel.

The DTRA budget request for fiscal year 2002 is over $1.1 billion. However, we will also provide executive management for the approximately $900 million Joint Chemical/Biological Defense Program. We also assist the Ballistic Missile Defense Organization and other U.S. Government organizations on a reimbursable basis. For example, the interagency Technical Support Working Group funds many of our blast mitigation and structural response field tests in order to make government facilities safer against car and truck delivered high explosives attack.

Although our mission spectrum is wide, our focus remains on supporting the warfighters. DTRA is a combat support agency and, therefore, subject to direct tasking by the Chairman of the Joint Chiefs of Staff, as well as the Secretary of Defense.

Although our focus will remain on the warfighters, we make important contributions to efforts to counter WMD terrorism at home. The Department of Defense does not have the lead responsibility for responding to acts of WMD terrorism within the United States. However, as the Department would likely be called upon should such an event occur, DTRA assists both preparedness and consequence management activities.

We share our WMD knowledge with the Department of Justice, FEMA, the Centers for Disease Control, and other Federal, state, and local officials. DTRA also maintains an operations center that provides the warfighters and government officials on-line access to a wide range of WMD expertise. DTRA also assists interagency exercise planning. We have also aided with the identification of issues that national, state, and local decision-makers would face should such an event occur. At the national level, we have worked directly and regularly with officials as senior as the Attorney General. Moreover, we have an important relationship with the Joint Forces Command's Joint Task Force for Civil Support. As a combat support agency, we offer planning, exercise, operational, legal, and public affairs support to this Joint Task Force.

I will conclude by noting that DOD and Congress agree that WMD challenges continue to evolve and grow. For fiscal year 2002, DTRA is requesting a budget growth for its R&D and mission-related O&M accounts. Specifically, we are requesting increases to enhance our capability to defeat the hard and deeply buried targets proliferating around the world, ensure the availability of radiation-hardened microelectronic components essential for our military and commercial space systems, and develop "energetic materials" to improve weapon lethality and chemical/biological agent defeat. The growth in our O&M budget request principally reflects expanded targeting support, additional balanced survivability assessments of critical command, control, and communications facilities, and expanded underground facility assessments support. In addition, we are pursuing a terrorist device defeat initiative that will enable us to defeat nuclear devices improvised by terrorists, attribute the origin of domestic nuclear events, and detect special shielded nuclear material. I respectfully request your support for our fiscal year 2002 program.

I would be pleased to answer your questions.

Senator LANDRIEU. Thank you, General.

Mr. Waldron.

STATEMENT OF ROBERT WALDRON, ASSISTANT DEPUTY ADMINISTRATOR, NONPROLIFERATION RESEARCH AND ENGINEERING, NATIONAL NUCLEAR SECURITY ADMINISTRATION

Mr. WALDRON. Thank you. Madam Chairwoman and members of the subcommittee, I am Robert Waldron, Assistant Deputy Administrator for Nonproliferation Research and Engineering at the National Nuclear Security Administration (NNSA). I would like to summarize my statement and request it be included in its entirety.

Senator LANDRIEU. Without objection.

Mr. WALDRON. Thank you. The NNSA's Nonproliferation and Verification Research and Development Program is focused on providing technology to operational users whose mission it is to strengthen U.S. responses to current and projected threats to national security posed by the proliferation of nuclear, chemical, and biological weapons. This program compliments the other nonproliferation programs within the NNSA which are Russian focused. We provide technologies that can be used worldwide and can be applied to making assessments about regional proliferation activities. Our goal is to enhance U.S. national security through needs-driven research and development. The emphasis is on developing the requisite technologies to detect and deter nuclear proliferation, to meet U.S. nuclear explosion monitoring goals, and to develop and demonstrate chemical and biological detection and related technologies to enable us to better prepare for and respond to the threat of domestic and biological attacks.

I used the phrase "needs-driven R&D" earlier to draw a distinction between the focus of our work and that of the DOD which is primarily requirements-driven. Since a significant portion of our R&D work is not tied to DOD or other formal requirements, we are able to take a longer-term focus and stay the development course to mature the technology. This needs-driven approach also allows us to pursue revolutionary, higher risk solutions that frequently push the state-of-the-art. Having NNSA conduct this needs-driven R&D allows us to marshal multi-disciplinary, inter-laboratory teams from the national laboratories to address these very challenging technical science and engineering problems.

Our tie to the operational community is strongest in the area of nuclear explosion monitoring where we have had an almost 40-year history of working together. Our relationship with the operators of the space and ground nuclear explosion monitoring systems is close and productive, and they acknowledge us as critical to the success of their efforts.

In addition to our connections to individual operational organizations, we also work closely with other developers. Our collaborations include a variety of projects and cooperative mechanisms from jointly funding development to developing joint technical roadmaps. While we have very close ties to individual developers and operational users, there are other more formal coordination mechanisms like the Counterproliferation Review Committee and various memoranda of understanding for technical operation with other agencies.

Based on our extensive cooperation and relationships and coordination with operational and development organizations, let me highlight some of the technical challenges we face. In the nuclear explosion monitoring area, challenges in the development of the next generation of NNSA satellite-based sensors are primarily in improving the sensor detection performance while maintaining or decreasing the sensor size, weight, and power. For the ground-based nuclear monitoring system, most of the challenges are seismic and brought about by the transition from current long-range—or teleseismic—methods to new regional monitoring methods. This change requires significant improvement of our understanding of how the earth's crust affects the passage of seismic signals.

For our program supporting homeland defense, the chief challenge facing researchers in the chemical/biological areas is biological detection. The challenge of distinguishing a threat pathogen from its harmless, very close relatives is pushing scientists to discover new and finer distinctions among organisms. Other technological gaps we face include accurately predicting where and how the plume of a threat agent will spread in, out, or around a building and in a city. An accurate understanding of the hazard area is critical to a rapid and effective response.

Detecting the diversion or smuggling of nuclear materials remains a constant challenge. The ability to detect plutonium and highly enriched uranium at standoff distances is driving us to explore not only new radiation detection materials, but also new detection systems.

Now let me move to our technology supporting national efforts to detect and understand WMD proliferation at its source. The challenge is to catch clandestine WMD programs at the earliest stage of development. Potential adversaries have taken considerable steps to disguise activities that might provide clear indications of the nature of their weapons development programs. Our challenge is to obtain sufficient information to enable us to distinguish steps in a weapons production program from closely related legitimate industrial activities. New sensors that detect new kinds of signatures are necessary and advanced processing and exploitation methods must be developed to create useful information out of this data.

The NNSA Nonproliferation and Verification R&D Program is essential to the agencies responsible for combating proliferation being able to fulfill their operational missions. It is well coordinated with individual users and other developers. There is no simple solution to this problem and we alone cannot solve it. With the support of Congress and through continued collaboration with DOD and others, and the necessary advances in technology and analysis techniques, we can make a quantum leap in our ability to detect and understand these threats. I would be pleased to answer any questions you may have.

[The prepared statement of Mr. Waldron follows:]

PREPARED STATEMENT BY ROBERT E. WALDRON

Madam Chairwoman and members of the subcommittee, thank you for the opportunity to testify on the Department of Energy (DOE) National Nuclear Security Administration's (NNSA) Nonproliferation and Verification Research and Development Program.

The NNSA's Nonproliferation and Verification Research and Development (R&D) Program conducts a full-scope R&D program from basic research through test and evaluation to produce technologies that lead to prototype demonstrations and resultant weapons of mass destruction (WMD) detection systems. Our mission is to provide these technologies to the operational users whose mission it is to strengthen the United States response to current and projected threats to national security posed by the proliferation of nuclear, chemical, and biological weapons and diversion of special nuclear material. The technologies are developed for a wide range of government users including the Department of Defense (DOD), the intelligence community and Federal health and safety agencies.

Detecting the proliferation of foreign nuclear weapons capabilities is an increasingly daunting task. A number of countries are seeking to acquire nuclear weapons. These nations and organizations take great pains to elude detection. The challenge is to detect and understand the threats posed by weapons of mass destruction at the earliest stage of development, to guide diplomatic actions and, if necessary, a military response. We must also deter the use of such weapons by being able to trace a weapon to its source before its use—or, in the worst case, after its use.

The NNSA's laboratories are the Nation's repository of expertise on nuclear weapons design and production. For more than 50 years, the Nation has tapped this resource in assessing foreign nuclear weapons programs. The labs have also supplied detection technologies to monitor these programs. The goal is to enhance U.S. national security through needs-driven R&D. The emphasis is on developing the requisite technologies to detect and deter nuclear proliferation, to meet U.S. nuclear explosion monitoring goals, and to develop and demonstrate chemical and biological detection and related technologies to enable us to better prepare for and respond to the threat of domestic chemical and biological attacks. To address the broad array of mission challenges our program objectives are to:

- Develop and demonstrate technologies needed to remotely detect the early stages of a proliferant nation's nuclear weapons program.
- Develop, demonstrate, and deliver technologies to detect, locate, identify, and characterize nuclear explosions underground, underwater, in the atmosphere, and in space.
- Develop technologies to improve our national capability to counter nuclear smuggling, to identify the origins of nuclear materials, to monitor global fissile material production, and to monitor Russian nuclear warhead dismantlement and Cooperative Threat Reduction programs.
- Develop, demonstrate, and deliver technologies and systems that dramatically improve our ability to detect the proliferation or use of chemical and biological agents, and to minimize the consequences of potential use of chemical or biological agents.

COORDINATION

The importance of stemming the proliferation of weapons of mass destruction is unquestioned. The Nonproliferation and Verification R&D Program fills a gap between basic research and application-specific acquisitions. These needs are not always documented in DOD or intelligence community requirement statements, but are based upon the realization that current technology will eventually become obsolete and/or understood by adversaries, thus new capabilities must be constantly pursued.

I used the phrase "needs-driven R&D" earlier to draw a distinction between the focus of our work and that of DOD which is primarily requirements-driven. Since a significant portion of our R&D work is not tied to formal DOD requirements, we are able to take a longer-term focus and stay the development course to mature the technology. This needs-driven approach also allows us to pursue revolutionary, higher risk solutions that frequently push the state of the art. Having NNSA conduct this needs-driven R&D allows us to marshal multi-disciplinary, inter-laboratory teams from the national laboratories to address these very challenging technical science and engineering problems.

A distinguishing feature of our work in recent years has been our success in understanding and communicating with the user community, both in understanding their needs and in transitioning technologies from purely R&D efforts into operational use or to follow-on R&D. Technology transition is always a challenge for research and development organizations, but without it the value of the R&D is not fully realized. I believe we are showing the way in terms of maintaining a cutting-edge research program while also keeping abreast of user needs and interests and transitioning technologies to satisfy them.

The tie to the operational community is strongest in the area of nuclear explosion monitoring where we have an almost 40-year history of working together. We provide remarkably capable and robust hardware for space systems, as well as expert advice in analyzing the data they produce, and are authors of the knowledge base critical to modernizing the Air Force Technical Applications Center's seismic monitoring capability. Our relationship with the operators of the space and ground nuclear explosion monitoring systems is close and productive, and they acknowledge us as critical to the success of their efforts.

In addition to our connections to individual operational organizations, we also work closely with other developers like the Defense Threat Reduction Agency (DTRA). Our collaboration with DTRA includes a variety of cooperative mechanisms from jointly funding development activities in nuclear warhead dismantlement to developing joint technical roadmaps for chem/bio.

While we have very close ties to individual developers and operational users, there are other more formal coordination mechanisms. The Counterproliferation Program Review Committee (CPRC) was established by Congress to coordinate all DOD, DOE, and intelligence community R&D programs for countering proliferation. We have been actively involved in the CPRC and its various focus or working groups. Recently the Chemical and Biological (CB) Defense Research, Development, and Acquisition Focus Group was established to develop a coordinated plan for DOE and DOD's CB technology development programs. Building on the success of an initial biodetection "roadmap", chemical detection, and soon decontamination, will be included in the CB roadmap. This will enable us to resolve any areas of possible duplication and to better integrate our technology development efforts toward national needs.

A few other formal interagency coordination mechanisms we participate in include:

- The Nonproliferation and Arms Control Technology Working Group (NPAC TWG), a multi-agency group I co-chair with my colleague here at the table Anna Johnson-Winegar and Sallie Mullen at the State Department. This group coordinates all Federal agency R&D programs related to nonproliferation and arms control.
- The NRO–NNSA Technology Partnership Panel, a working group to coordinate interactions in research and development, information systems, personnel exchanges, and security.
- The Space Technology Alliance, a multi-agency forum to address national space technology issues such as the health of the U.S. space industrial base, maintenance of critical U.S. space infrastructure and skills, and coordination of interagency technology development activities.

TECHNOLOGY CHALLENGES

Based on our extensive cooperative relationships and coordination with operational and development organizations, let me highlight some of the technical challenges we face.

Nuclear Explosion Monitoring: Challenges in the development of the next generation of NNSA satellite-based sensors going on-orbit aboard the next block of Global Positioning System satellites in 2005 are primarily for the optical sensors. This challenge is extreme, involving the development of focal plane array "active pixel" technology. In effect, thousands of individual optical sensors will be fit into a space not appreciably larger than that required for today's single optical sensor. In addition to solving substantial hardware challenges, we will have to develop the on-board processing algorithms needed to discriminate natural events, such as lightning, from nuclear explosions on thousands of individual optical sensors as opposed to a single sensor. Significant technology challenges also exist for us as we develop a small, low-weight, low-cost payload to replace existing neutron and gamma-ray sensors. Size, weight, and power restrictions present challenges to provide sufficient sensor sensitivity with an acceptably low false alarm rate.

Most of the challenges for the ground-based nuclear explosion monitoring systems are very computationally intensive. Seismic challenges are brought about due to the transition from current long-range, or teleseismic, methods to new regional monitoring methods. This change requires significant improvement of our understanding of how the earth's crust affects the passage of seismic signals through it and to differentiate a nuclear explosion from the enormous number of background nonnuclear events like mining blasts and earthquakes. With a better understanding of the earth's geology on a regional basis, we will improve the capability for identification, location, and characterization of nuclear explosions and be able to lower the yield-detection thresholds. We also need to automate the calibration of new seismic stations to increase the speed with which they can be brought into the monitoring system and enable the user to do more of the future data upgrade themselves.

Homeland Defense: In the chem/bio area, the chief challenge facing researchers is biological detection. Specific and selective detection of biological agents is generations behind that of chemical agents. The challenge of distinguishing a threat pathogen from its harmless, very close relatives is pushing scientists to discover new and ever finer distinctions among organisms. The more we learn about pathogens, the less we know. As these distinctions are developed, we must develop detection methods to exploit these differences. Once these methods are developed, engineers must advance the state of the art in detectors to utilize and apply these methods. Eventually, these detectors will need to be refined to increase the breadth of biological agents covered and decrease their costs.

Other technological gaps we face include accurately predicting where and how a plume of a threat agent will spread in a building and in a city. Specifically, we face the challenge of working backward from detector measurements to decipher information about the amount, location, and type of agent released. This release information is a crucial variable in accurately predicting the hazard cloud. An accurate understanding of the hazard area is critical to a rapid and effective response.

A new detector alone, regardless how sophisticated, cannot protect its user from harm unless it is integrated into the user's standard operating procedures. We are proud of our efforts in addressing this gap between the laboratory and the 'real world.' Our demonstration and application programs work closely with user partners to integrate emerging and off-the-shelf technologies into potential systems to address real world needs in areas such as biological aerosol detection at special events, a chemical detection and response system in subways and airports, and biological forensic investigations. This gap is especially crucial in the civilian realm, where structured requirements and identified needs for technology to fill do not exist.

Detecting the diversion or smuggling of nuclear materials remains a constant challenge. The ability to detect plutonium and highly enriched uranium at standoff distances is driving us to explore not only new radiation detection materials, but also new detection system concepts. In addition to new detectors and materials, we are confronted with the need to develop new concepts for networking a collection of sensors into an integrated architecture for layered defense networks and perimeter monitoring systems.

Proliferation Detection: Now let me move to our technology supporting national efforts to detect and understand WMD proliferation at its source. The challenge is to catch clandestine WMD programs at the earliest stage of development. Potential adversaries have become witting of our traditional monitoring methods. They have taken considerable steps to disguise activities that might provide clear indications of the nature of their weapons development programs. Analysts are left to piece together a more complex puzzle, often attempting to determine how much of legitimate industrial activity might be used in support of a weapons program.

Our challenge is to obtain sufficient information to enable us to distinguish steps in a weapons production program from closely related legitimate industrial activities. Yet we are forced to gather this information from great distance, during limited access opportunities, or under other stressing circumstances. New sensors that detect new kinds of signatures are necessary, and advanced processing and exploitation methods must be developed to make sense of this data. Ground breaking science and engineering is needed to open up new detection and monitoring opportunities, but it must be built on a foundation that includes:

- a thorough understanding of the current and likely future threat,
- assessments of the adequacy of current capabilities to detect and monitor this threat,

- identification of gaps in our capabilities and recognition of opportunities to improve our capability, and
- feedback and evaluation of the technical limits and programmatic feasibility of implementing new capabilities in an operational environment.

This foundation comes from the historical expertise of the DOE's nuclear weapons program and intimate involvement with both the arms control/intelligence analysis community and the intelligence collection community. This foundation ensures that our technology developments are relevant, and we are working on complete end-to-end approaches to solving national priorities. We must ensure that the problems we are addressing are critical, the new or improved collection methods are robust, the information has utility, and the employment concept of the technology is realistic. Some of the key challenges we face include:

- Validation that new sensor systems will provide actionable information. This involves field trials in an environment where we often don't have surrogates of the threat we are attempting to detect and monitor. In some case we can make use of U.S. weapons program infrastructure or rely on the cooperation of American industry. In specific cases, we operate special test facilities such as the Spill Test Facility, a national resource we maintain for our own and other agencies' use.
- Acceptance of new complex detection methods in an environment of shrinking analytical resources. We must ensure our exploitation methods are robust and save time. New tools are difficult to adopt unless they lessen overall workload, especially when existing data sources swamp the limited analytical personnel.
- New detection and monitoring systems produce massive quantities of data, and we are often limited by small data bandwidths. Thus, we must develop methods to autonomously process the data at the sensor and send back only the meaningful parts. This raises the issue of confidence in both the sensor and the data exploitation that must be thoroughly addressed through testing.

CONCLUSION

The NNSA Nonproliferation and Verification R&D Program is essential to the agencies responsible for non/counterproliferation being able to fulfill their operational missions. It is well coordinated with individual users and other developers, as well as through formal coordinating organizations.

Our technology will get even better—because it must. Rogue countries, terrorists and the suppliers of the nuclear, biological, and chemical tools of their trade are using increasingly sophisticated means to evade detection. Our methods and technology must outpace this growing threat.

There is no simple solution to this problem, and we alone cannot solve it. With the support of Congress and through continued collaboration with DOD and others and the necessary advances in technology and analysis techniques, we can make a quantum leap in our ability to detect and understand these threats to the American people.

I would be pleased to answer any questions you may have.

Senator LANDRIEU. Thank you.

Dr. Koch.

STATEMENT OF DR. SUSAN KOCH, ACTING ASSISTANT SECRETARY OF DEFENSE FOR THREAT REDUCTION

Dr. KOCH. Thank you Madam Chairman. I am Susan Koch, Acting Principal Deputy Assistant Secretary of Defense for Strategy and Threat Reduction.

It is a pleasure to appear before the subcommittee to discuss the DOD's plans to continue to use the Cooperative Threat Reduction, or CTR, program, to address the threat posed by the remnants of the former Soviet arsenal of weapons of mass destruction. I too have submitted a longer statement, which I would request be included in the record.

Senator LANDRIEU. Without objection.

Dr. KOCH. Thank you. I would like just to touch now on some of the highlights of our request for the Cooperative Threat Reduction program for fiscal year 2002. Let me preface my remarks by noting that the administration is completing its review of nonproliferation and nonproliferation-related cooperative programs with Russia to include CTR. Thus our budget request and the proposed assistance activities that I will discuss this afternoon are subject to the conclusion of that review.

Our program's single largest effort, as it has been for the last several years, will be in strategic offensive arms elimination programs in Russia. This program will accelerate elimination of strategic nuclear delivery systems, ballistic missiles, silo launchers, and ballistic missile-carrying submarines. Another important effort in Russia will be our nuclear weapons storage security program. This assistance will enhance Russia's ability to secure, control, and account for nuclear weapons and their storage by providing equipment and training for guard forces, security upgrades at nuclear weapons storage sites, and furthering developing an inventory control system to track nuclear weapons scheduled for dismantlement.

Closely related is the request for nuclear weapons transport security, which primarily funds transportation services to move nuclear warheads from deployed sites to storage and from storage to dismantlement, thereby facilitating Russia's acceleration of warhead dismantlement.

An important element of our request for fiscal year 2002 will be the slightly over $41 million for the elimination of weapons grade plutonium production in Russia. As originally envisioned, this project would convert the cores of the three remaining Russian plutonium producing reactors so that they would continue to provide heat and electricity to the surrounding regions without producing weapons grade plutonium. Unfortunately as we worked on the project, it became increasingly clear that the reactor cores could not be converted safely enough to meet our standards. We therefore, about 18 months ago, embarked on a study of the best approach to bringing an end to Russian plutonium production and have determined that the provision of fossil fuel alternatives, which would allow for the complete shut-down of the plutonium producing reactors while continuing to provide needed heat and electricity, would be the fastest, least risky, and most cost-effective approach to the overall problem, and have the distinct advantage of having the complete shut-down of reactors, as I mentioned.

Another important planned program is in the area of chemical weapons destruction and an end to Russia's ability to produce chemical weapons. We have requested funds to continue to help Russia dismantle two former Soviet chemical weapons facilities and to help construct a destruction facility for something over 5,000 metric tons of dangerous artillery and missile delivered nerve agent at a town called Shchuch'ye.

The Shchuch'ye project has been discussed with this committee more than once in the past. The committee and the Senate have, in the past, laid down important conditions for a project that would serve U.S. security interests in the most efficient, cost-effective manner. The conditions outlined by the Senate have definitely attracted the attention of our Russian partners and we believe they have made substantial progress in addressing congressional concerns over Russia's slow progress in meeting destruction-related requirements. We have also made considerable progress with friends and allies in increasing international assistance to the project.

Turning to Ukraine, the major effort is the continuation of our strategic arms elimination effort there, which will continue to work on the final elimination of SS–24 intercontinental ballistic missiles in Ukraine and begin eliminating Backfire bombers. In Russia, Kazakhstan, and Uzbekistan in particular, we also plan to continue our biological weapons proliferation prevention program to enhance safety and security for dangerous biological pathogens, consolidate and dismantle production and research facilities, and support peaceful collaborative research projects with former Soviet scientists once involved in offensive biological weapons programs.

Finally, we hope to continue and expand our Defense and Military Contacts program under CTR to nearly 500 events involving high-level meetings between defense officials, staff talks, and unit exchanges. We particularly value these activities which help restructure former Soviet defense establishments, professionalize the military units, promote democratic civilian control of the military, and establish programs of cooperation on counter-proliferation.

We believe that our 2002 budget request, which I have just summarized, is a sound and reasonable approach to increasing U.S. security through nonproliferation and threat reduction assistance to the former Soviet Union. Thank you.

[The prepared statement of Dr. Koch follows:]

Prepared Statement by Dr. Susan Koch

INTRODUCTION

When the Soviet Union collapsed in 1991, it left behind a huge arsenal of weapons of mass destruction (WMD) and associated delivery systems, materials and infrastructure. The Nunn-Lugar Act of 1991 (i.e., the Soviet Nuclear Threat Reduction Act) charged DOD with establishing a program to assist the Soviet Union and any successor states to destroy, safeguard and prevent the proliferation of WMD.

Over the past 10 years, the resulting $3.6 billion CTR Program has proven effective in pursuing these objectives. CTR assistance helped Belarus, Kazakhstan and Ukraine become nuclear free and accede to the Nuclear Nonproliferation Treaty by 1996. The CTR Program also has assisted in the deactivation of 5,586 nuclear warheads and elimination of 740 ballistic missile launchers, 87 heavy bombers, 20 ballistic missile submarines, and 645 ballistic missiles. Additionally, CTR assistance has reduced the likelihood that sensitive materials, technology, expertise, and equipment may fall into the wrong hands.

Beyond this, CTR assistance is working to improve the accountability for warheads, enhancing safe storage of WMD and related materials, and reducing the opportunities for unauthorized acquisition of nuclear weapons and materials, related systems, and technology.

The administration is completing a review of all nonproliferation assistance programs to Russia. One area of concern is that we do not want U.S. investment in the CTR Program to become a means by which Russia frees up resources to finance its strategic modernization programs. In this regard, the CTR Program does not provide funds directly to the Russian government. Instead, DOD contracts with entities that provide specific, measurable deliverables related to weapon elimination, transportation, and security services. It is not clear the Russians would eliminate their weapons without the CTR Program of assistance. Leaving them in place makes them vulnerable to theft or sale to other countries or groups.

FISCAL YEAR 2002 CTR PROGRAM

DOD's overall fiscal year 2002 budget request for CTR is $403.0 million. As noted earlier, the administration's review of nonproliferation assistance to Russia is not yet complete, and DOD's budget request for CTR for fiscal year 2002 and the description I will give today of the projects that would be pursued under that request remain subject to the conclusion of that review.

Under CTR's the Strategic Offensive Arms Elimination program area in Russia ($133.4 million), the U.S. will seek to accelerate the elimination of nuclear delivery systems and missile launchers. We hope to eliminate SLBM launchers and dismantle the associated SSBNs. We will transport, dismantle, and eliminate 117 liquid fueled SLBMs, 16 liquid fueled ICBMs, and 70 solid fueled ICBMs and SLBMs. Also, we will continue to construct a solid propellant disposition facility, continue to operate and maintain liquid propellant disposition systems and eliminate 48 mobile ICBM launchers.

Under the Nuclear Weapons Storage Security program area in Russia ($56.0 million), we hope to enhance the security, control and accounting of nuclear weapons and their storage. We will continue to test, integrate and train at the Security and Assessment Training Center and procure 10 suites of security equipment to be deployed at nuclear warhead storage sites. Additionally, we will continue site renovation and installation of five suites of security enhancement equipment, procured with fiscal year 2001 funds, at nuclear warhead storage sites. In addition, we plan to install 31 kilometers of perimeter security systems at MOD nuclear weapons storage sites; procure communications and other safety, support and heavy duty equipment for site security operations; continue to procure additional portable drug and alcohol testing equipment to ensure personnel reliability; and continue maintenance and life cycle support for the Automated Inventory Control and Management System for tracking nuclear weapons scheduled for dismantlement.

Also, the Nuclear Weapons Transportation Security program area ($9.5 million) will facilitate warhead movements from alert systems to secure storage and dismantlement facilities in Russia. More specifically, this project will fund transportation services for deactivated nuclear warheads to move from deployed locations to enhanced security storage sites and to dismantlement facilities.

The Elimination of Weapons Grade Plutonium Production project ($41.7 million) originated in 1997 when the U.S. and Russia agreed to convert the cores of the three remaining Russian reactors (two at Seversk and one at Zheleznegorsk) that produce weapons-grade plutonium to eliminate this production capability. The U.S. agreed that the reactors could not be shut down because they serve the energy needs of the local regions. By early 2000, however, it became clear that the reactor cores could not be converted safely. DOD notified Congress of the need to explore an energy alternative to supply the local needs. The results of these studies determined a fossil alternative is the most effective and efficient means to stop weapons-grade plutonium production. It has the added benefits of being low risk since it uses well known technologies and it permits the complete shutdown of these three Chernobyl-type reactors.

In Ukraine, the Strategic Nuclear Arms Elimination (SNAE) program area ($51.5 million) will sustain joint efforts to eliminate SS–24 ICBMs to include continued storage of 163 solid rocket motors, completion of construction of a solid propellant disposition facility, removal of propellant and elimination of 66 missile motors. Under the WMD Infrastructure Elimination (WMDIE) program area in Ukraine ($6.0 million), we also hope to eliminate ICBM liquid propellant facilities, strategic airbase infrastructure and nuclear weapons storage facilities. The WMDIE program area in Kazakhstan ($6.0 million) will continue securing fissile and radioactive materials and initiate elimination of strategic airbase infrastructure and ICBM liquid fuel storage facilities in fiscal year 2002.

With regard to the Chemical Weapons Destruction Facility (CWDF) at Shchuch'ye, the Russian government allocated $100 million in 2001 for Chemical Weapons Convention compliance including $25 million to support the CWDF at Shchuch'ye. This project will enable the destruction of a nerve agent stockpile of 5,460 metric tons in highly portable artillery and missile munitions, and will provide an opportunity for more international assistance. The U.S. has encouraged other countries to assist with the Shchuch'ye project. Canada has provided $70,000 for infrastructure design and plans to provide an additional $180,000 this year. Italy recently agreed to provide $7.15 million in assistance for Shchuch'ye. The European Union also has committed $1.8 million to this project. The United Kingdom is considering providing up to $18 million for Shchuch'ye infrastructure projects. Other countries have expressed interest in supporting these kinds of projects at the indicated approximate funding levels: Netherlands $2 million, Norway $1.0 million, Sweden $700,000, and Switzerland a significant portion of $20 to $30 million. These offers are contingent upon resumption of the project by the U.S. The fiscal year 2002 budget includes $35.0 million for the CWDF and $15.0 million for dismantlement of former CW production facilities.

Under the Biological Weapons (BW) Proliferation Prevention program area ($17.0 million), we will continue to seek enhanced safety and security for dangerous pathogen collections, consolidation and dismantlement of infrastructure associated with BW production and research facilities, and collaborative research projects with former Soviet BW scientists.

The CTR Program also provides funding ($18.7 million in fiscal year 2002) for a wide range of defense and military contacts between DOD and FSU defense establishments. Overall, the objectives of the Defense and Military Contacts (DMC) program are to encourage denuclearization and nonproliferation, to enhance stability by regular exchanges on issues of mutual concern, to encourage and assist the restructuring and downsizing of FSU defense establishments, and to encourage support for democratic reform. In short, while this component of the program helps reduce the risk of weapons of mass destruction in a way that is less direct and less quantifiable, it is no less important to addressing the larger threat.

Funding for program management, administrative support, audits and examinations and other assessments, or "overhead" are 3.3 percent of the total fiscal year 2002 budget ($13.2 million), reflecting the fact that this is an efficient enterprise.

CHALLENGES

At the program implementation level, our biggest challenges are transparency across the board, and access to facilities. Despite their generally sincere interest in achieving program objectives, the Russians are reluctant to give us visibility into sensitive military processes and access to sensitive facilities. One example of this is the continuing struggle to include a measure of weapons origin and complete a transparency regime for the Mayak Fissile Material Storage Facility. Visibility and access are critically important, not only to conduct agreed activities, but to conduct required audits and examinations that help ensure that CTR resources continue to be used for the intended purposes.

CONCLUSION

CTR contributions to national security include the elimination of START-accountable nuclear weapon delivery systems and warheads; and efforts to reduce the threat from the use or proliferation of chemical and biological weapons through the Chemical/Biological Weapons Proliferation Prevention Program; the relationships formed through professional exchanges foster greater mutual understanding, increase confidence, encourage denuclearization, nonproliferation, and enhance stability through the regular exchange of views on issues of mutual concern. Additionally, CTR Programs inhibit the transfer into the wrong hands of sensitive materials, technology, expertise and equipment.

Continued congressional support is important to the future success of CTR's nonproliferation efforts and its role in enhancing U.S. national security vis-á-vis the former Soviet Union.

Senator LANDRIEU. Thank you all very much for your testimony. I think our time will allow us two rounds of questions, 5 minutes each. But to the subcommittee members, if you require more time, please just let me know.

Let me begin with you, Dr. Winegar, for just a few questions. There have been a number of concerns about the safety of the primary disposal method being used to eliminate our chemical weapons. Naturally, people want to make sure that this process is safe and effective. Could you comment on the risks associated with destroying relative to the risk of keeping these stockpiles in communities where they are now being stored? Or the risk of not eliminating them? If you could compare those risks and elaborate somewhat along those lines.

Dr. WINEGAR. Certainly. I think our desired goal is the safe and complete destruction of the existing stockpiles. As you indicated in your question, it is a matter of balancing the risks between the alternative of doing nothing—that is leaving the stockpiles intact and taking the chance of further deterioration or the possibility of an inadvertent, outside event such as an earthquake or lightning or something like that that we cannot control which could cause significant impact—and contrast that with the safety record that has been compiled in the program thus far where we have essentially completed the destruction of the weapons at Johnston Island and are well on the way to completing the stockpile that is at the Tooele facility. Those have been done with a safety record that I think is outstanding and certainly is comparable to, if not better, than similar types of industry records.

Senator LANDRIEU. Thank you. Earlier this year Secretary Aldridge—and you mentioned this in your statement and I just wanted to follow up—decided to increase the level of oversight for the chemical demilitarization program in the Office of the Secretary of Defense in part by making it a major acquisition program. You testified to this. Can you explain in more detail what the practical effect of this will be, the changes that it has made, and what benefits you can see?

Dr. WINEGAR. Certainly. By elevating the program to an A–CAT 1D, that in essence means that Secretary Aldridge himself will be involved in all major decisions related to the program. He is by definition the official milestone decision authority for the chemical demilitarization program. The first actual event that will occur is the comprehensive DAE review that I also mentioned in my testimony. That has been such an extensive undertaking that in point of fact, it has been ongoing for about a year now. So, I think that attests to the fact of the level of detail that we are accumulating for him. That detail is being scrutinized by a number of independent offices from the Office of Secretary of Defense level both from a comptroller's point of view, the PA&E point of view, and from a number of different groups who have not had the opportunity to review all of that information in that level of detail.

Senator LANDRIEU. Did we discuss when that review will be completed?

Dr. WINEGAR. Yes. It will be completed the first week in September.

Senator LANDRIEU. We can expect that. One more question regarding the Chemical Weapons Convention to eliminate all of our chemical weapons by 2007 and our efforts to try to remain on schedule. In previous years, Congress has reduced the funding for this program below the requested levels because there was a view that it was such a large budget—more than a billion dollars this year—that it wouldn't hurt the program to do with a little less money. Am I right in understanding that the funding you have requested for this fiscal year is necessary to keep us on track toward meeting that goal? Do we look like we are going to be on track if in fact we can keep the money that is in the budget, or do we need more?

Dr. WINEGAR. I certainly support the budget that was submitted in the President's budget request, which is approximately $1.3 billion for fiscal year 2002. I think we have adequately justified the particular items in the budget that are needed. Again, this will be subjected to that fine level of scrutiny and detail that I mentioned, in the upcoming DAE review.

Just to refresh your memory, this budget was prepared by the Army in accordance with direction from the previous administration, and so this will be Secretary Aldridge's and indeed Secretary Rumsfeld's first opportunity to have this level of detail in the review of that budget.

Senator LANDRIEU. Was there anything that you know of regarding how that study is being conducted that would indicate we would need significantly more or could do with significantly less money? Is anything clear at this point about that study?

Dr. WINEGAR. There are a number of working teams doing this on a daily basis. I have not at this point been briefed on the results of their discussions and I think it would be premature at this point to speculate what the possible ramifications might be.

Senator LANDRIEU. Thank you, Dr. Winegar.

Senator Roberts.

Senator ROBERTS. Thank you, Madam Chairman. In 1998, Secretary of Defense Cohen held up a bag of sugar on television and stated the extraordinary killing power of an equal amount of anthrax. Secretary Cohen, our former colleague, planned to have all 2.4 million personnel immunized before 2004. He testified in hearings last year which were extremely helpful. We learned about BioPort and that is not good news to say the least. We had an expenditure of millions of dollars in exchange for no usable vaccine.

So basically the program has been terminated. Riding to the rescue was Senator Hutchinson, who said we ought to fund something called government-owned, contractor-operated—the acronym is GOCO—vaccine production facilities. He had the place to do it, the expertise to do it, and the money to do it. We are waiting for a report. I yield to the person that has more expertise on this than I do, Senator Hutchinson, because I know this is a pertinent issue with all of us. I would like to reserve the balance of my time, but I would like to yield to the Senator to follow up on that question. I feel it is exceedingly important.

Senator LANDRIEU. Go right ahead.

Senator HUTCHINSON. Thank you, Senator Roberts. Dr. Winegar, let me ask you first, when is the report expected?

Dr. WINEGAR. Sir, the report has been completed for quite some time now and has been delayed being delivered to Congress pending delivery of the budget. It is certainly my understanding that it is imminently going to arrive here.

Senator HUTCHINSON. Can you tell me what its recommendation is?

Dr. WINEGAR. Well, sir, there are a number of parts to that report as you would recall from the language. One specifically addresses the projected costs—the lifecycle costs—for a vaccine facility. While I do not have those numbers on the top of my head, I can assure you it is a very detailed analysis of not only the planning, design, and construction, but the follow-on 20 years or more to operate such a facility because that has to be factored into the decision.

The other part of the report summarizes and indeed provides all the detail of an expert group, an expert panel commissioned by the former Deputy Secretary of Defense, Mr. DeLeon, where we brought in their expertise to leverage best practices from the industry to again help us make some of these decisions.

Finally, we were directed in that report to consult and coordinate with the Department of Health and Human Services, specifically the U.S. Surgeon General, and that part of the report is included also.

Senator HUTCHINSON. Back in the 1990s you did an exemplary job in heading up a group that made recommendations for a GOCO for vaccine production which would have, had it been implemented, averted the BioPort disaster. I think the jeopardizing of our troops who are not getting the anthrax vaccinations as they should be. The site selection process that was used at that time, will the same criteria be used in the site selection for a new GOCO facility?

Dr. WINEGAR. All of those criteria will be used but the acquisition strategy that we plan to pursue this time is a bit more broad. Let me be specific on that. The earlier study limited possible site selection to military bases for a variety of reasons; number one being security, number two being availability of land, etc. We have decided that the best approach is to make it a totally open competition so that potential competitors to our solicitation could indeed offer to build such a facility on private land, and then of course one of the evaluation criteria would be cost in addition to all the other criteria.

Senator HUTCHINSON. Will you assure the subcommittee that the site selection process will be fair and transparent?

Dr. WINEGAR. Absolutely.

Senator HUTCHINSON. Would you give me the assurance that as the criteria is established for site selection, that I will be briefed on that and before site selection is made, that I will receive such a briefing?

Dr. WINEGAR. Absolutely. We intend to keep this subcommittee and any other interested members of Congress fully apprised of the situation, bearing in mind that we do have to adhere to the rules regarding the procurement of sensitive information, etc.

Senator HUTCHINSON. The President's budget recommendation for this, I think, was $700,000. Under that funding scheme, it will be 2008 before such a GOCO facility will be fully active. I think that is absolutely unacceptable. We have too much in jeopardy with the growing threat of biological weapons. I think it is imperative that we accelerate that. If the subcommittee were able to plus up the authorization to say $40 million, would the Department be able to utilize that kind of a funding level over the next 2 years to accelerate a GOCO facility?

Dr. WINEGAR. Well, I certainly am one that is ready to admit my limited expertise in the areas of construction. Certainly the time frame that we have developed is one that can be critically reviewed. In addition to the actual design, planning, and construction, I want to say for the record that, even once such a facility is built, an imperative part of the process is the validation and certification by the Food and Drug Administration, which will indeed encompass several years, the latter part admittedly——

Senator HUTCHINSON. Hopefully with much greater success than Bioport.

Dr. WINEGAR. Yes, sir.

Senator HUTCHINSON. Well, let me just close. I want to thank again the Senator from Kansas for yielding his time. This is not only a critical national issue but something very important to me personally. As I stated in my opening statement, we actually had an instance of two deaths of recruits because a commercial vaccine production facility would not make them any longer. This is a prime example of the need for us to move very expeditiously on this GOCO concept. I thank you for your leadership on it and I look forward to working with you.

Dr. WINEGAR. If I could just add one point of minor clarification. Senator Roberts specifically mentioned the need for anthrax vaccine and Senator Hutchinson is referring to a vaccine for adenovirus. I want to make sure that the record is clear that our concept for such a vaccine facility is one that is flexible and broad enough to be able to encompass the appropriate kinds of technology for multiple vaccines.

Senator HUTCHINSON. I appreciate that because I think that is a very critical point because the emphasis gets placed on anthrax and that is certainly a part of the program. But there are a number of vaccines that we are not seeing the commercial sector produce because it is not financially viable.

Dr. WINEGAR. Right. I just wanted to make sure that the subcommittee was aware of the fact that we are looking not only to today, but as the title of your subcommittee suggests, to the emerging threats and whether the next ones on the horizon are smallpox and plague or further down the road is Ebola or whatever. That indeed will be the challenge to us as we try to design such a facility with maximum capability and surge capability to meet all the needs.

Senator HUTCHINSON. Thank you, Madam Chairman. Senator Roberts, have I forgotten anything?

Senator LANDRIEU. Senator Roberts.

Senator ROBERTS. I am going to yield again, Madam Chairman, in that our resident veterinarian and taxidermist and chemical demilitarization expert here was straining there with a question. Senator Allard, did you want to follow up?

Senator ALLARD. I just wanted to compliment you on the fact that you are having an open, competitive process to decide to turn to the private sector. I was glad to hear you were thinking in terms of flexibility on the production lines because you never know what kind of organism you might have to deal with in turn.

Dr. WINEGAR. Exactly.

Senator ALLARD. The other thing I would share with you is that if you put your production facility all in one spot, there are things that could happen: power supply, maybe contamination of the facility. Depending how critical—I hope there is an analysis of how critical you think this constant supply is—if it is very critical then you may want to consider having two production spots so you do not have all your apples in one basket. If you think there is a moderate, critical need there, then maybe one facility would meet your needs. But I would assume that you have given that some thought as you have gone through this process.

Senator HUTCHINSON. If I might just add to a very valid point. I think multiple production facilities might be viable. Having multiple storage facilities under FDA approval might meet the same need as the concern of having that deterrent in one location.

Senator ALLARD. You may need to have some legislation to speed along, although I think they have an emergency process where they can rapidly approve vaccines and I would not think we would need legislation because I think that is already in place. But if not, we may have to consider something to make sure this moves more rapidly. I would agree with my colleague from Arkansas that 2007 seems a long way out to me.

Dr. WINEGAR. I certainly want to reassure the subcommittee that on a professional and personal basis, I am constantly in contact with my colleagues from the FDA who do have the resident expertise that will be required for validating and approving such a facility, and also have very strong connections with Pharma and Bio and a number of the other organizations to whom the industry and the manufacturing sector report. I take your comments very seriously with regard to both multiple production sites and clearly multiple storage sites for what I consider a key element for our National defense program.

Senator ALLARD. I have another question.

Senator LANDRIEU. Why don't we see with Senator Roberts.

Senator ROBERTS. It is going to have to wait because I have yielded twice now and I am just not going to do it anymore. [Laughter.]

Senator LANDRIEU. We will get back to order. We were thinking about these two sites, Yucca Mountain and offshore Florida, which are interesting sites for this anthrax. Senator Roberts, I am going to step out for a minute to take care of some business—would you continue with your round of questioning?

Senator ROBERTS. I would be delighted to and I will finish up quickly so Senator Allard can follow up. Dr. Winegar, you have added some capacity to your duties. You are the chemical demilitarization poster person down at the Department in your capacity as the Deputy Assistant to the Secretary of Defense. Staff informs me that when we took a look at the issue areas that this subcommittee would explore—"the things that keep us up at night"—that was a question that we asked quite a few folks in the last session and the session before that. Your portfolio has now increased to include all the things that are now in our pasture. So, welcome to our insomniac club.

Dr. WINEGAR. Sir, I think I am a charter member of that club.

Senator ROBERTS. Your position is starting to resemble something that was formerly at the Pentagon—the Assistant to the Secretary of Defense for Nuclear, Chemical, and Biological Defense. We have said over and over again, why can't we have another one of those. If you wanted to call it something else, I guess you could. I do not know what the acronym for that is—A–S–D–N—nevermind.

Dr. WINEGAR. A–T–S–D–N–C–B.

Senator ROBERTS. You know it.

Dr. WINEGAR. I know it well.

Senator ROBERTS. What are your thoughts on filling the position? That was a nominated position. That was something that we had to approve.

Dr. WINEGAR. That's correct.

Senator ROBERTS. How are you doing down there? Why don't we get you that title if you want it? Because we have tried to single out how important this is, and with this new position I think it is at least commensurate with what was happening before. So my question is, should this position continue to go unfilled? How can we help you do your job so we all get a good night's rest?

Dr. WINEGAR. Yes, sir. Thank you for the opportunity to address that. Mr. Aldridge who is the Under Secretary of Defense has indicated to me that this is a high priority for him and that he does intend to nominate someone to fill that position. It is my understanding that he is interviewing potential candidates for that. As you mentioned, the complete title of that job is Assistant to the Secretary of Defense for Nuclear and Chemical and Biological Defense Programs. I have no expertise and no part of my portfolio encompasses nuclear matters.

The way that office has been structured in the past is that there have been in fact two deputies: one to handle nuclear matters and the other, which I am currently filling, is the Deputy for Chemical and Biological matters. You are absolutely right. That is and should be a Senate-confirmed position. I look forward to getting a new boss to stay up late at night with me too.

Senator ROBERTS. Senator Allard.

Senator ALLARD. Mr. Chairman, thank you. I just wanted to ask a question about how are we faring with meeting some of the deadlines with some of these weapons conventions. They are coming upon us here. Are we going to meet those deadlines? What are the biggest challenges you see in us being able to meet them?

Dr. WINEGAR. Certainly I think that it is going to indeed be a very big challenge for us to meet the ultimate deadline which is the complete safe destruction of all the weapons we have in our stockpile. I think we are off to a good start. I think that with the other facilities that are well under way with regard to construction or actually in systemization planning that we have a very good chance of destroying the vast majority of the weapons in the stockpile. Of course there are always issues that might come up that could delay what we have projected to be the throughput rates for those facilities, etc.

In my personal opinion, the major obstacles for us to overcome are to make technology decisions regarding the stockpiles at Pueblo and Blue Grass. Until we make those decisions we cannot really move forward down the path with the construction and operation of a facility.

Senator ALLARD. If I recall your testimony, spring 2002 was when you would get your first decision.

Dr. WINEGAR. That is correct.

Senator ALLARD. If you do not see any impediments coming up, when would you predict we could get moving with the Pueblo?

Dr. WINEGAR. Well, we actually have money in the fiscal year 2002 budget and we are starting some of the infrastructure improvements that are not technology specific, such as upgrades to utilities. We cannot do anything that would be determined predecisional until the entire RCRA process is completed, etc. But I think we are well-positioned with the money we have in the 2002 budget and our projections for the budget beyond that time to quickly execute whatever path we decide to follow.

Senator ALLARD. In some of the communities we have been discussing the possibility of impact fees. My question is, where would the money for these proposed impact fees have to come from? How could it effect the chemical demilitarization programs for these sites?

Dr WINEGAR. It is my understanding that the Department of Defense has no authorization and no legal grounds to provide such impact fees to these communities.

Senator ALLARD. So if a community decides to apply an impact fee, the ultimate decision that would come out of the Department of the Defense is what?

Dr. WINEGAR. The Department has no authorization to pay such fees.

Senator ALLARD. So their response would be what?

Dr. WINEGAR. Their response would be we have a program in place to complete the destruction of these and we have not factored in any funds to address an impact fee.

Senator ALLARD. If the community insists on the impact fee, then you would have to walk away from where you are at that point? How would you deal with that?

Dr. WINEGAR. I would certainly think we would have to seek help in negotiation or seek some type of relief outside the current limitations that are set on the Department.

Senator ALLARD. Well, I know in Pueblo there was some discussion about applying an impact fee by City Council or some of the elected officials there locally.

Dr. WINEGAR. Yes.

Senator ALLARD. The message that we left is that it would severely impede the ability to move forward on that project.

Dr. WINEGAR. That is correct.

Senator ALLARD. Would that be the proper response?

Dr. WINEGAR. That is correct.

Senator ALLARD. OK. Thank you very much. Thank you, Madam Chairman.

Senator LANDRIEU. I have several more questions but Senator Roberts, why don't you go ahead.

Senator ROBERTS. We do not want to leave the rest of the witnesses out. But I have just two quick questions for Dr. Winegar. The United States Marine Corps has been testing a new technology called electro-chemically-activated decontamination solution. I understand that in a recent 3-day test that was conducted by the Corps—the Marine Corps Assistance Command and the CBERF Team—this, what we call ECA technology, did demonstrate it was an effective decontaminate and exceeded all test requirements. Any thoughts on this? Does this sound to you that this is an area where we ought to plus up some investment on behalf of the Marine Corps?

Dr. WINEGAR. Sir, I have been briefed on that electro-static decon program, as a matter of fact, from the Clean Earth Technologies Group and the folks at the University who are cooperating with that project. I think the results to date are promising and we have spoken with them. Again this is another example of a program that can be conducted in academia and industry to a certain point, and then when they actually need to test it against some of the pathogens we have to develop a collaborative relationship with our Defense Department laboratories and I believe that is the status of that project at the moment.

Senator ROBERTS. I mispronounced this program. This is electrochemically-activated decontamination solution. What did I say? Oh, I am getting static. [Laughter].

The reason I ask you that, because I am going to ask the General a question down the road here on our vulnerability in regards to the warfighter on chem/bio defense and how DTRA is doing. This is the kind of thing that we really need to press ahead on. Two years ago I was out in California when I saw the CBERF outfit work through its training. So if we are not doing the job we ought to do—not that we don't want to do the job—why this is extremely important.

The last thing I have for you, in my opening statement I talked about the fact the money is coming out of the Army in regards to procurement. Why can't we get a general funding program? Is it possible for the chemical/demilitarization funding to be transferred within the Army procurement account to other programs? This is a national program. Why are we making the Army pay for it, or the Air Force for that matter?

Dr. Winegar. Sir, I think that again is one of the options that we will be looking at as we complete our comprehensive DAE review for Mr. Aldridge. We have made it clear that all options are on the table and whether that should be a defense-wide account versus an Army account is clearly one of the issues that we will be discussing at that time.

Senator ROBERTS. Tell Secretary Aldridge that a very reasonable and effective Chairman of the Emerging Threats and Capabilities Subcommittee asked that question and a very obstreperous ranking member asked it as well.

Dr. WINEGAR. Yes sir, I will convey that to him.

Senator LANDRIEU. Great. That will put fear in him. Let me ask Mr. Waldron, I understand that DOD and DOE—you testified to this—are working together to develop bio detectors. What is the status of our demonstration and application programs? In other words, the devices that can detect chemical and biological agents in heavily populated areas like subways, airports, even events of limited duration, will these technologies eventually be installed or used on military installations as well? Could you also talk about the state-of-the-art standoff chemical and biological detectors today and how the agencies are contributing to development efforts in this? How are your agencies contributing to the development efforts in this arena?

Mr. WALDRON. I think I have all that. First of all, in regards to demonstration projects, we have two major demonstrations—we call them DDAPS factored after the Defense Department's ACTDs, one of which will be conducted in Salt Lake City for the Salt Lake City Olympics. We have already done a quarter-scale demonstration in Salt Lake City with Utah public health people. Basically it is some distributed air sampling systems that continually pull in the air deposited onto a piece of filter paper and then every 4 hours we have someone go out and change the filter paper. The filter paper goes back to a laboratory and then we use laboratory techniques to look for the potential biological agents.

So, we have in place a field laboratory that we will be using in Salt Lake City for the Olympics. This has been coordinated with the FBI, the Salt Lake City Olympic Committee, and the Utah public health people. We are going to provide a capability for the Utah public health people to make an assessment if there may be a release during the Olympics.

Senator LANDRIEU. Let me just follow up with this. Maybe this is a common sense question. If you detected it on the filter would it be too late? Once it is detected on a filter, the danger of the agent already spreading in that way, is that what the technology is positioned to do?

Mr. WALDRON. Well, what we are doing is, it is being collected on the filter paper and then we take it to a laboratory and analyze it. The answer is that you can either have a detection system that detects right away and alarms or you can have a system that you use and detect so you can then treat the exposed people. The technology is not there, right now, that would not have a significant false alarm rate, for detecting something right away.

Senator LANDRIEU. So this is for the accurate analysis and then effective treatment in the event something terrible happened.

Mr. WALDRON. Right. So then the Public Health Service will be able to say, everyone that was in the Correll Center or whatever venue it was during the certain time, you need to get to a hospital to get treated. Our understanding is that as long as you can get people to treatment within the 12- to 24-hour timeframe after exposure then they can be successfully treated.

Senator LANDRIEU. Thank you for clarifying that. Dr. Koch, during conference on last year's defense authorization bill, we talked about the closure of these plutonium plants in Russia and I know we are proceeding. You mentioned that we have decided that it is too costly and too dangerous to try to convert so we are going to close and try to reorganize with a fossil fuel source. What are our options there, would there perhaps be some green energy options for the region or clean energy production? I understand our options may be coal or another fuel source—you did not elaborate. What are our options, since we are doing this, to try to skip a generation of technology and get some clean power to this region?

Dr. KOCH. Madam Chairman, I confess I do not know the details and so if I could expand on my answer for the record, I would appreciate it. We are looking at both coal and oil-fired plants that would at a minimum be to American environmental standards—so it would be, I would think, an increase in environmentally sound approaches compared to traditional Russian fossil fuels.

[The information referred to follows:]

During 2000, the Department of Defense and Ministry of Atomic Energy evaluated options for providing heat and electricity to the surrounding communities in the closed cities of Seversk and Zheleznogorsk, which is a Russian requirement in order to shut down the three remaining Russian plutonium production reactors. The final U.S. study compared the costs of producing the required heat and electricity by coal or converting the reactor core design to allow continued operation without production of weapons-grade plutonium. The study included a section evaluating the prospects of increasing the energy efficiency in the distribution and consumption of the heat and electricity.

The final study was restricted to coal and conversion because other technologies, which were evaluated in earlier studies, were rejected for technological, meteorological, or economical reasons. Other technologies were not included in the final report. The cost to the Russian utility to purchase oil or natural gas at competitive rates is approximately five times the cost per megawatt for coal. In addition, pipelines to supply oil or natural gas to the two cities do not currently exist and would have to be built, also adding to the project cost. New nuclear reactors were eliminated because the capital investment was an order of magnitude greater than coal or conversion.

Hydroelectric power was rejected because it is seasonal, and not available in the winter when demand is highest. In addition, hydroelectric power generates only electricity and does not directly satisfy the primary requirement for district heat. Solar energy was eliminated due to location and weather. Both of these cities are located only 600 miles south of the Arctic Circle. In the winter, when the heat and electricity demand is the highest, the days at these northern latitudes are very short and production from solar technologies are at their lowest and intermittent. Similarly, wind power was also rejected as being intermittent and is regarded as a supplemental, not a primary, source of power.

Hence, only projects involving coal plants are practical for this location.

Senator LANDRIEU. Compared to what they have there, I am sure it is going to be an improvement. But I would like you to get back to me about those options because there is extraordinarily fast moving technology in this area and whether it is clean coal or cleaner oil or even solar, there are many exciting and interesting opportunities.

While we already have a certain distribution network in the United States for new places in the planet, there are other options that we did not necessarily have when we began. I think we should be open to that. So, if you could give me some details I would be interested.

I have one more question. The NNSA research program, Mr. Waldron, has been cut substantially. If our analysis is correct, there appears to be approximately a $50 million cut in research. What impact is this going to have on ongoing research projects? What impact will this have on the future? What will the impact be on the people who actually do the research?

Mr. WALDRON. The simple answer obviously is that it is going to delay a significant amount of work that we have had underway. We are also looking at terminating a few efforts prematurely. We have not gotten to formal, final assessment of the technology. It impacts our ability, obviously, in the future to address the technical challenges that I presented in my testimony. It draws things out. It makes our ability to make these technologies available on a fairly rapid basis drawn out. We are also not able to address as many technical options as we would like to. Obviously the impact on the people doing the work is not an impact on the DOE and NNSA and my staff. We are going to have jobs, but the impact is going to be substantial at the NNSA laboratories.

Senator LANDRIEU. Let me ask you this and forgive me for not knowing the totals, but what does this $50 million represent in terms of a percentage cut?

Mr. WALDRON. About 25 percent.

Senator LANDRIEU. So it is a pretty steep cut in research.

Mr. WALDRON. Yes, ma'am.

Senator LANDRIEU. While you have not determined how exactly you are going to deal with that, could you just indicate a few things that you know of that may have to be cut, that we may have to walk away from? I know we have not decided exactly how this cut is going to be implemented and all of those decisions have yet to be made, but could you just share some of that with us?

Mr. WALDRON. One of the things is in our proliferation detection area. We are going to substantially scale back. Our look at hyperspectral technologies that would be able to detect chemicals associated with the production of nuclear weapons and potentially chemical agents, that is one area; also some laser-based technology doing the same type of work to look at various chemical species. That is one significant area. The other is that we will substantially delay our support to the Air Force Technical Application Center in seismic calibration as they move to this regional-based monitoring system. So there are a couple of areas.

Senator LANDRIEU. There are consequences for every cut and of course we want to try to maintain our balanced budget and our fiscal discipline. I want the record to reflect that I believe the ranking member has also indicated this in other cases, we know how important the research and technology aspects of our budgets are to maintain our ability to refocus and reshape and redesign and explore places we have not been before but where real threats exist. Sometimes you save money in the short run, but when you cut your research you lose a great deal of the money over the long term. I would like to work with all of you and look forward to working with the members, thank you for your testimony.

That completes my questioning. Senator Roberts, do you have anything to add?

Senator ROBERTS. I have just a couple of questions.

Senator LANDRIEU. We have about 5 minutes. Go right ahead.

Senator ROBERTS. General, last November the GAO reported that the services were not really integrating chemical and biological defense into unit exercise, and the training, if done, was not always realistic in terms of how the units would operate in war. In your opening testimony, you indicated that DTRA is basically a combat support or warfighter support agency. DOD reported last year that the Army's combat training centers continued to see units of all levels unable to perform all chemical and biological defense tasks to standard. That is what I was referring to in my other question. What is your assessment of the chemical and biological defense training by our combatant commanders? How is DTRA assisting the CINCs and the warfighter?

General BONGIOVI. Sir, I would say right now we do work with the warfighting CINCs and we exercise with them. It would be hard for me to assess right now what their capability is because I think they are just beginning to understand the threat out there and their capabilities. We work in the area of chemical and biological defense and the technology side of that. We work under the joint chemical and biological defense program, which Dr. Winegar oversees. That program establishes the technologies and capabilities out there in terms of detection, protection, clean-up, training, and those kinds of things.

Under that program, we are executing right now what is called an ACTD, an Advanced Concept Technology Demonstration, over in Korea at Osan Air Force Base called Reststops—restoration of operations. That process is really looking at a fixed site, a chemical/biological simulated attack on a fixed site and how we would respond procedurally and with technology. It is actually a 3-year activity.

Senator ROBERTS. Excuse me for interrupting—you always have the threats that you have to prioritize and deem whether they are appropriate or not. When we went to North Korea several years ago with Chairman Stevens trying to assess what Kim Jong Il was up to, at that particular briefing we were told a whole series of things that could very well happen and the closeness of that base and Seoul to the border, etc., could be utter chaos if that ever took place. As a matter of fact, I do not know how you could really treat anybody. I think it was about 17 minutes away or something similar if anything were to happen. But was that factored in, in terms of when you got to conduct the exercises? Does that mirror what you think a possible threat——

General BONGIOVI. Yes sir. When we——

Senator ROBERTS. There's a criteria there.

General BONGIOVI. Yes, sir. When we do a demonstration of that nature with a warfighter, one of the CINCs will volunteer to be the operational manager of that. In this case, PACOM chose U.S. forces in Korea because of the immediacy of the threat. We simulate the attack as it would be likely to happen under those scenarios.

Senator ROBERTS. I apologize for interrupting you again. One of the lessons learned in the Intelligence Committee and the Armed Services Committee on the U.S.S. *Cole* was the need for increased frequency of vulnerability assessments like the Joint Service Integrated Vulnerability Assessments—basically military installations, ports, air facilities, both around the world and the United States. We have just seen the Pentagon step up to that, and you have that requirement. How is that impacting your agency, your personnel, and are you conducting exercises along those lines?

General BONGIOVI. Not necessarily exercises, sir. As I mentioned in my statement, we do a hundred force protection assessments under the direction of the Chairman. That is what you referred to, what you called JSIVAS.

Senator ROBERTS. What's the acronym?

General BONGIOVI. JSIVAS. Joint Staff Integrated Vulnerability Assessments. We just increased the number of teams doing that. We are now moving away from fixed installations to forces in transit. So, the Chairman is restructuring that program as a result of the U.S.S. *Cole.* We have not been asked to expand it beyond the hundred that we are doing right now.

Senator ROBERTS. Right. I did not want to leave you out, Dr. Koch. Thank you for your past testimony and your work. You referred to the conditions that we have with Shchuch'ye. When we were in the majority those were called the Roberts Initiatives, but now we just call them conditions.

Senator LANDRIEU. We can still call them the Roberts Initiatives.

Senator ROBERTS. Where do you think we are on that? We even had the Russians come here and say that the conditions were appropriate for them to step up to their responsibilities. We got into a situation with the House of Representatives where the funding was not forthcoming. I need to know where you think we are in terms of the administration's support. I think they have recommended that the restriction on the funding be lifted, but they haven't said anything about the conditions. I think the conditions have been very helpful for long-term cooperation. Am I right in this respect? What do you think?

Dr. KOCH. Senator, I absolutely think you are right and perhaps it is even more important that the Russian responsible for chemical weapons destruction thinks you are right. He has said more than once that the conditions you outlined helped him greatly within his government with focusing attention and pointing them on a good path ahead. We have had good progress on all fronts.

They have dramatically increased their fiscal year 2001 budget for chemical weapons destruction, including $25 million for Shchuch'ye. They are working very hard on a systematic overall destruction plan, which they had lacked before. They are working on being able to transport chemical weapons for destruction in just a very few sites as opposed to the many that they had once planned. Their work at the Shchuch'ye site on the general infrastructure, which we would require to go ahead, continues apace. On the non-Russian front, our friends' and allies' contributions, commitments, and statements of very strong interest about contributions now total about $55 million.

Senator ROBERTS. So we have not only statements of support but actual contributions. Senator Lugar is extremely interested in this. $20 million in fiscal year 2000 funds were authorized for security enhancements. But how can we do this unless the Russians step up? Are they going to destroy the other nerve agents at this plant? So we decided that the most important thing that we do is enhance the security. But I note here that only $6 million has been obligated. Why is that? There is $14 million here that—and this is back in fiscal year 2000. Do we know that?

Dr. KOCH. Again I will have to find some details. I do know that the actual costs of the needed security enhancement was less than initially projected, but if——

Senator ROBERTS. I am not sure the GAO feels that those security enhancements are the best that we could do. But my final response for the record is that $442 million authorized and appropriated for fiscal year 2001 CTR still not obligated.

Dr. KOCH. On its way, sir. We are, of course, required to notify Congress of our intention to obligate funds each fiscal year and we had delayed notification while the administration was reviewing all the assistance programs to Russia. We did in early June send up an initial notification for several projects using fiscal year 2001 funds. As the review completes, we will send up the notification for the remainder.

Senator ROBERTS. Well, we have 2002, $458 million authorized and appropriated for fiscal year 2000 still unobligated. Why don't you include all of that in one report and get it back to us? That is all, Madam Chairman. Thank you. Thank you Dr. Koch for the job you do.

Senator LANDRIEU. Thank you, Senator Roberts, for focusing on that because it is very important and a bone of contention between our committee and the House. We need to move forward on that.

Thank you all for your testimony and as I said the record will be open for another 48 hours and you are welcome to submit additional statements. Please respond to the questions that were asked to be submitted. Thank you all very much, the meeting will be adjourned.

[Questions for the record with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR PAT ROBERTS

1. Senator ROBERTS. General Bongiovi, the U.S. has demonstrated in the Gulf War and subsequent military operations worldwide that we have weapons with pinpoint accuracy. As a result, our potential adversaries are increasingly locating critical command facilities and WMD-related infrastructure in hard-to-destroy bunkers and tunnels.

Do we have the capability today to defeat bunkers and tunnels?

General BONGIOVI. We have the capability to defeat most bunkers (those structures that are excavated, then covered with soil and concrete), but under limited circumstances. We generally have to fly directly over or very near the target to drop our penetrating weapons ("direct attack"), which often carries significant risk since such high-value targets are often heavily defended. An improvement is the current procurement of Joint Air-to-Surface Standoff Munition (JASSM), which has some standoff capability (such that the aircraft would still have to fly over the threat country, but not the target itself), and can penetrate on the same order as our workhorse direct attack penetrator, the 2,000 pound BLU–109. Weapons that will provide improved penetration and significant standoff (no aircraft flight over the threat country) are the Conventional Air Launched Cruise Missile Penetrator (Initial Operational Capability 2002), and the potentially Tactical Tomahawk Penetrator Variant (Initial Operational Capability 2005) depending on U.S. Navy support. Both of these weapons will be developed under an Advanced Concept Technology Demonstration (ACTD) program managed by DTRA.

We have even less capability to defeat tunnels (structures that are excavated directly under existing rock). These structures can be protected by up to several hundred meters of hard rock versus the 2–20 meters of soil and concrete used for most bunkers. Significant shortfalls exist in both our capability to collect and analyze intelligence data, and our capability to functionally defeat these facilities with conventional weapons. Current nuclear weapons can defeat most tunnel structures. However, shortfalls still exist against the very deepest structures, and in our ability to reduce the resulting nuclear collateral effects.

2. Senator ROBERTS. General Bongiovi, what is DTRA contributing to this?

General BONGIOVI. DTRA is a central player in providing capability to characterize and defeat hard and deeply buried targets. We apply our significant background in underground facility design to assist the intelligence community in identifying typical signatures and reverse engineer to fill knowledge gaps. We have robust defeat programs that cut across conventional weapon, nuclear weapon, and special operations capabilities against this target set. Our ACTDs have delivered the Advanced Unitary Penetrator (BLU–116/B), the Hard Target Smart Fuse, and are supporting the development of penetrators with significant standoff capability, such as the CALCM Penetrator and the Tactical Tomahawk Penetrator Variant. DTRA's test division has pioneered the delivery concepts of Optimized Dual Delivery (multiple weapons optimally released along a common laser path), and the skip-bomb delivery as an alternative method to penetrating deep targets. DTRA tunnel defeat demonstration facilities at the Nevada Test Site have provided a community focus in working the hard and deeply buried target (HDBT) problem end-to-end using all warfighting capabilities. DTRA also chaired the HDBT Defeat Interagency Working Group for OSD that authored the draft DOD/DOE–DP HDBT Science and Technology Master Plan. Finally, as a Combat Support Agency, we are able to quickly transition new capabilities to the warfighter through the use of deployable expert teams, or through reach-back support in a 24 hours, 7 days per week operations center.

3. Senator ROBERTS. General Bongiovi, under the terms of the Chemical Weapons Convention (CWC), U.S. government and privately-owned facilities are subject to inspection. DTRA has the implementation role for the CWC and is responsible for escorting the inspectors of the CWC when they inspect U.S. government and commercial facilities.

Is DTRA able to provide these escorts and fulfill the requirements of the CWC or is DTRA facing compliance issues regarding the staffing of these escort positions?

General BONGIOVI. There are no Chemical Weapons Convention compliance issues currently foreseen regarding the staffing of these escort positions. However, DTRA has determined that the most economical and effective way to fulfill the escort requirements for Department of Defense (DOD) facilities is through the use of contractor employees reporting to a U.S. Government employee team chief. This would maximize flexibility, minimize cost, and accommodate the fact that the escort mission at DOD facilities is of finite duration. However, the language in the Chemical Weapons Convention Implementation Act of 1998 precludes the use of contractor employees. Unless the proposed amendment is adopted, DTRA will be required to hire civilian employees to perform these escort functions.

4. Senator ROBERTS. Mr. Waldron, I have reviewed the fiscal year 2002 budget request for the Office of Nonproliferation Research and Engineering in the National Nuclear Security Administration. If the goal of this office is to conduct R&D on technologies that detect and deter nuclear proliferation, meet U.S. nuclear explosion monitoring goals, and to develop and demonstrate chemical and biological detection and related technologies, why is your office funding a construction project?

Mr. WALDRON. You are correct Senator. The goal of our office is to conduct R&D that advances nonproliferation technologies. Therefore, it was a corporate decision for us to sponsor the construction of a facility that will consolidate many of our activities and other related activities of the Office of Defense Nuclear Nonproliferation and the Office of Intelligence because of our program management and technical oversight skills. This new facility will enhance the efficiency of R&D development and improve the physical infrastructure and security at Los Alamos National Laboratory by centralizing activities that are currently scattered over six different technical areas at the Los Alamos site. The fiscal year 2002 funding represents the final request for funds for construction of the facility, which will be operational during fiscal year 2003.

5. Senator ROBERTS. Dr. Koch, last year the Fiscal Year 2001 National Defense Authorization bill required the CTR program to provide several reports to the committee during fiscal year 2001. These reports are long overdue. For example, the Section 1307 Fossil Fuel Alternatives Options Report was due to the committee on December 30, 2000. Similarly, the Section 1308 Consolidated Annual CTR Report was due to the committee on February 5, 2001. Finally, the Section 1309 Russian Chemical Weapons Elimination Report was due to the committee on January 30, 2001. To date we have not received these reports nor have you been able to tell staff when these reports will be delivered.

Are you now in a position to tell the committee when these reports will be delivered?

Dr. KOCH. The Department regrets that these reports were not submitted in a more timely fashion to the committee. The response required for Section 1307 Fossil Fuel Alternatives Options Report, the annual report called for by Section 1308, and the Section 1309 Russian Chemical Weapons Elimination Report are awaiting the results of administration and departmental review of nonproliferation programs for Russia. We will provide the reports as soon as possible.

6. Senator ROBERTS. Dr. Koch, why is the $442 million authorized and appropriated for fiscal year 2001 for CTR still not obligated?

Dr. KOCH. According to CTR's authorizing legislation, Congress must be notified prior to obligation of appropriated funds. While waiting to learn of the results of the administration's Russia review, the Department of Defense notified Congress on June 2, 2001 of its intent to obligate $105.9 in fiscal year 2001 funds for several CTR programs expected to be supported by the review. As of August 3, 2001, $23.9 million had been obligated. When the review is completed, the Department will send Congress notification of the remaining $336.5 million.

7. Senator ROBERTS. Dr. Koch, of the $458 million authorized and appropriated for fiscal year 2000, why is half still unobligated?

Dr. KOCH. Section 1306 of the National Defense Authorization Act for Fiscal Year 2000 requires a determination of whether DOD is the most appropriate agency to execute CTR and a congressional report reflecting the results of this determination. Once the Secretary makes the determination, we will prepare the report for submission. Section 1306 precludes DOD from obligating 50 percent ($229.1 million) of its fiscal year 2000 funds until this report is submitted. As of August 3, 2001, the Department has obligated 91 percent of the fiscal year 2000 funds available for obligation.

QUESTIONS SUBMITTED BY SENATOR SUSAN COLLINS

8. Senator COLLINS. Dr. Winegar, in your prepared testimony you stated that the Department of Defense owes the local communities around demilitarization facilities the best, and not necessarily the easiest, disposal possible. The Department is expending a substantial amount of funding to develop effective sensor technologies to provide real-time, near-instantaneous detection of chemical agents to protect American troops.

Does the chemical demilitarization program at the present time have adequate technologies for the monitoring of demilitarization of facilities?

Dr. WINEGAR. Yes, the chemical demilitarization program has adequate sampling and analytical technologies to monitor the demilitarization facilities. The environment inside and outside all demilitarization facilities is continuously monitored for protection of workers and the public. The demilitarization facilities have installed a network of "near real-time" (less than a 10-minute cycle time response) monitors at all the facilities. The monitors, automatic continuous air monitoring systems (ACAMS), are devices that continuously sample and analyze ambient air for the presence of agent in the plant and stack effluent. The ACAMS is an automatic gas chromatograph that cycles from sampling to analysis, providing a direct readout of the chemical agent concentration. The ACAMS computes the chemical materiel masses associated with the monitoring level based on its calibration of instrument response, sample collection time, and sample flow rate through a preconcentrator tube. A strip chart recorder provides real-time printouts and a historical log of the ACAMS chromatogram. The ACAMS generates an audible alarm when the chemical materiel concentration exceeds the preset alarm level. The ACAMS provides internal diagnostic checks to determine the operability of the system and software determines whether various operating parameters are within predetermined limits. If the ACAMS are operating outside the limits, an error message appears on the front control panel, and a malfunction status signal is sent to the control room.

The demilitarization sites also use a depot area air monitoring system (DAAMS) to confirm ACAMS alarms and provide historical monitoring of the facility perimeter. The DAAMS is comprised of solid sorbent tubes and associated equipment. Air monitoring with DAAMS employs air aspiration through the sorbent tube for a predetermined period of time at a controlled air flow rate. The DAAMS samples are then analyzed in the laboratory to detect chemical materiel at the desired monitoring levels TWA (time weighted average), ASC (allowable stack concentration), and GPL (general population level). Laboratory analysis uses thermal desorption of the analytes from the sorbent tubes into a gas chromatograph/flame photometric detector (GC/FPD) or gas chromatograph/mass selective detector (GC/MSD) analytical system. Duplicate DAAMS sampling at sample stations allows for confirmation of chemical materiel readings by analyzing replicate samples on dissimilar analytical columns or on the GC/MSD if sufficient analyte mass is available.

9. Senator COLLINS. Dr. Winegar, would any leakage be detected in a timely fashion?

Dr. WINEGAR. Yes, each facility has numerous monitoring devices strategically positioned throughout the demilitarization facility to detect any potential releases from the demilitarization process. The locations are dependent on such conditions as: (1) probability that agent will be present at concentrations in excess of established limits; (2) nature of the source of agent; (3) probability that individuals are present in the area; and (4) level of protective clothing used in the area. All demilitarization facilities have a network of automatic continuous air monitoring system (ACAMS) devices that continuously sample and analyze ambient air within near real-time (less than a 10-minute cycle response time). These ACAMS units are used as process monitors and early warning devices in the event of a chemical agent leak or spill. The ACAMS are networked into the continuously manned facility control room to provide alarms in the event of equipment malfunction and leak or spill of chemical agent materiel. The depot area air monitoring system (DAAMS) is used to confirm ACAMS alarms and provide historical data of sampling locations. Throughout chemical demilitarization operations, monitoring and sampling will be performed routinely at locations selected to provide optimum information to ensure maximum protection for workers, the public, and the environment during operations.

The program manager for chemical demilitarization (PMCD) has detailed and intricate quality control and monitoring concept programs defining requirements to ensure that the monitoring system and analytical methods can reliably detect and quantify chemical agents. The PMCD reviews and evaluates the laboratory quality control data from each facility. The Department of Health and Human Services (DHHS) is an oversight agency that reviews and evaluates the effectiveness of the monitoring system and laboratory activities. DHHS and PMCD annually inspect laboratory operations to determine their readiness and preparedness to operate and support safe facility operations.

10. Senator COLLINS. Dr. Winegar, is the demilitarization program tracking the advances made in detection/sensor technology?

Dr. WINEGAR. The demilitarization program tracks advances in detection/sensor technology by routinely attending vendor's presentations and briefings on recent and state-of-the-art advances in monitoring and analytical equipment. In addition, we work with technical companies to assist this program in evaluating advances in monitoring and analytical technology. Also, we use the services of technical contractors to evaluate the latest advances in monitoring technology. The scope of tasks range from performing literature searches to testing, sampling, and monitoring equipment with chemical agent to determine sensitivity and specificity in identifying and quantifying chemical agents. The PMCD communicates frequently with DHHS personnel, providing them with current information and details on the evaluations and studies performed to improve and enhance the PMCD monitoring program. The PMCD briefs the National Research Council of the National Academies of Science at least once a year on the status of efforts to improve monitoring of chemical agents and potential future efforts that could improve the monitoring of chemical agents. PMCD has tasked various laboratories to evaluate different technologies such as the operability of the Fourier Transform Infra-Red (FTIR) Spectrometer, Chemical Ionization (CI) Mass Spectrometer/Mass Spectrometer (MS/MS), Ion Mobility Spectrometer (IMS), and others. The FTIR study was performed with an ACAMS unit to determine the sensitivity during a demilitarization operation. The FTIR was able to identify chemical agent at high concentrations, but it could not identify and quantify chemical agent at required lower concentrations. The CI–MS/MS was used for a study at the common stack for the three types of furnaces and was not able to quantify chemical agent at the required current monitoring level. The IMS was tested but could only identify chemical agent at high levels or what would be described as battlefield concentrations. Since the demilitarization facilities require a much lower level of detection, each of these approaches was considered impractical for operational use.

11. Senator COLLINS. Dr. Winegar, is the Department's demilitarization program pursuing any R&D on improved detection and monitoring technologies? If so, could you elaborate on what those technologies are?

Dr. WINEGAR. Yes, the PMCD has developed several technical tasks for development of improvements to the monitoring program. PMCD constantly evaluates and upgrades current methods and technology to improve detection efficiencies. Though the current capabilities meet or exceed the requirements as outlined by DOD and the EPA, the PMCD is continuing to evaluate and modify the current ACAMS devices and software to reduce the response time to facility releases and increase performance efficiency. PMCD plans to evaluate the depot area air monitoring system (DAAMS) technology to collect sufficient sample in satisfying proposed lower exposure levels. One possibility is to equip the ACAMS monitoring system with a DAAMS sampling device on the front end to collect a great volume of sample for the lower detection limits. The PMCD has evaluated the gas chromatograph/atomic emission detector to determine its sensitivity and specificity. This technology has adequate sensitivity; yet, it requires large sampling volumes to reach this sensitivity and the instrument is maintenance-intensive.

The technologies that are used to monitor for chemical agents at U.S. chemical stockpile sites provide excellent capabilities for detection and identification of agents at low levels in near real-time. The ACAMS can identify the presence of chemical agent in near real-time at less than half the concentration of the stated worker population limited time weighted average, which is the regulatory limit established to which a worker may be exposed for 8 hours a day over an entire career with no adverse health effect.

The DOD Chemical and Biological Defense Program is investing in sciences and technology for the detection and identification of chemical and biological agents. However, these technologies are being developed for the primary purpose to protect the warfighter against attacks by adversaries with chemical or biological weapons.

As a result, the system needs are focused on providing real-time detection of concentrations of agent that pose an immediate threat to life and health. In addition, these capabilities are generally intended to be more compact and ruggedized for field use. This is in contrast to the monitoring capabilities for chemical demilitarization sites, which use laboratory quality instrumentation of high sensitivity to monitor in support of operations at the stockpile and destruction sites. One project that may yield information to support chemical demilitarization monitoring activities is the Low Level Chemical Agent Research Program, which is conducting research to determine the effects of exposures to low levels of chemical agents.

12. Senator COLLINS. Dr. Winegar, the Department of Defense has been actively pursuing research and development of sensor technologies to help defend against chemical and biological weapons. Congress, and particularly the Senate Armed Services Committee, has supported this DOD research effort and has included substantial increases beyond the budget request in recent years.

Are you satisfied with the progress that has been made in this technology area?

Dr. WINEGAR. Since Operation Desert Storm, there have been increased investments in chemical and biological sensor technologies to improve upon our capabilities. Significant progress has been made in fielding new capabilities to protect our warfighters against the continuing threats from chemical and biological weapons, and new systems are in development that will provide further improvement in the next few years. Additionally, investments in the science and technology base are addressing many of the difficult technical and scientific challenges in order to allow detection and identification of existing and emerging threat agents in sufficient time to provide warning to protect against the threat before our forces have been exposed. In summary, there has been a great deal of progress over the past decade and our strategy promises to yield further improvements over the coming decade. However, technical barriers and the evolving threat environment will continue to pose challenges.

Since Operation Desert Storm, the services have fielded the following detection capabilities:

- *Automatic Chemical Agent Detector and Alarm (ACADA)*—Automatic point detection of nerve and blister agents.
- *Biological Integrated Detection System (BIDS)*—Vehicle-mounted biological detection and identification capability.
- *Improved Chemical Agent Monitor (ICAM)*—Handheld surface off-gas sampling capability for nerve and blister agents.
- *Improved Point Detection System (IPDS)*—Ship-based improved automatic point detection of nerve/blister agents.
- *Interim Biological Agent Detector (IBAD)*—Shipboard biological point detection capability.
- *Portal Shield network sensor system*—Biological point detection capability to protect high value fixed sites against BW attacks.
- *Remote Sensing Chemical Agent Alarm (RSCAAL)*—Standoff detection of nerve and blister agents.

The following developmental systems are planned to be fielded in the mid-term:

- *Joint Biological Point Detection System (JBPDS)*—Automatic long line source and point/mobile biodetection to detect and identify bio-agents; programmable.
- *Joint Chemical Agent Detector (JCAD)*—Improved, all-agent programmable automatic point detection; portable monitor, miniature detectors for aircraft interiors; interior ship spaces; wheeled and tracked vehicles; and individual soldiers.
- *Joint Service Lightweight Chemical Agent Detector (JSLSCAD)*—Lightweight, on-the-move, passive standoff detection for chemical agent vapors.

In addition, there are several being explored in the technology base:

- *Joint Chemical Biological Agent Water Monitor (JCBAWM)*—Detection of CB contamination in water.
- *Joint Modular Chemical/Biological Detector System (JMCBDS)*—Automated, integrated detection of both biological and chemical agents in a single sensor package.
- *Joint Service Warning and Identification LIDAR Detector (JSWILD)*—Standoff detection, ranging, and mapping of chemical vapors and aerosols.
- *Chemical Imaging Sensor*—Passive standoff detection technology for detection on-the-move at high speeds from a distance.

Additionally, there is investment in science and technology base for detection of contamination on surfaces, non-specific agent identification, standoff biological agent detection, and other key technologies.

[Whereupon, at 4:05 p.m., the meeting was adjourned.]

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